UNITED STATES ARMY

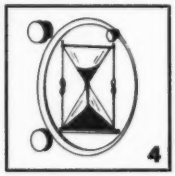
OCTOBER 1972

AVIATION DIGEST

Orval Right Discovers A New World
page 42

UNITED STATES ARMY AVIATION DIGEST

OCTOBER 1972 VOLUME 18 NUMBER 10


4

16

22

32

Views From Readers 1
The Way Of The Future: Low Level 2
Instrument Flight WITHOUT Instruments 4
Ground Safety—
Nomenclature: Tractor Warehouse 6
Who What Why? 7
Can You Remember What An
Autorotation Is . . . Really? 8
IFR At Tac-X 10
Is Your Aircraft Mission Ready? 12
One Man's Way 14
Aeromedic—The Flight Surgeon In Flight 16
Maintenance Matters 20
Everything You've Always Wanted To Know
About Artillery Advisories 22
The Fuzz Also Fly 24
Getting The Job Done Through Attitude 30
Right Side Up Or Upside Down? 32
Aviation Accident Prevention Forum 38
Pearl's 40
Orval Right Discovers A New World 42
To Live And Learn 44
Full-time, Part-time Aviator 46
USAASO Sez 48

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ABOUT THE COVER

Introducing Orval Right, Chief Advisor on Matters of Aviation, who will be appearing regularly in future issues. See page 42.

The mission of the U. S. ARMY AVIATION DIGEST is to provide information of an operational or functional nature concerning safety and aircraft accident prevention, training, maintenance, operations, research and development, aviation medicine, and other related data.

The DIGEST is an official Department of the Army periodical published monthly under the supervision of the Commandant, U. S. Army Aviation School. Views expressed herein are not necessarily those of Department of the Army or the U. S. Army Aviation School. Photos are U. S. Army unless otherwise specified. Material may be reprinted provided credit is given to the DIGEST and to the author, unless otherwise indicated.

Articles, photos, and items of interest on Army aviation are invited. Direct communication is authorized to: Editor, U. S. Army Aviation Digest, Fort Rucker, Ala. 36360.

Use of funds for printing this publication has been approved by Headquarters, Department of the Army, 1 October 1970.

Active Army units receive distribution under the pinpoint distribution system as outlined in AR 310-1. Complete DA Form 12-4 and send directly to CO, AG Publications Center, 2800 Eastern Boulevard, Baltimore, Md. 21220. For any change in distribution requirements, initiate a revised DA Form 12-4.

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VIEWS FROM READERS

Sir:

Although I feel Captain Hatton's article in your May issue emphasizing the importance of a standard instrument qualification for all aviators has great merit, I feel compelled to take issue with his philosophy that, "The need for better instrument training is outweighing the advantages of low level flight as Army aircraft and aviation missions become more sophisticated."

Although I totally support Captain Hatton's proposition that all Army aviators possess a standard instrument ticket, I feel he has underestimated the importance of developing proficiency at low level flight.

As the Vietnam era of flying draws to a close, the Army will be placing increased emphasis on training air crews to survive on a mid-intensity type battlefield where highly sophisticated antiaircraft weapons are prevalent. Unless aviators are able to maneuver their aircraft *below* the horizon of enemy radar controlled antiaircraft guns and *below* the minimum surface-to-air missile altitudes, it is highly unlikely they will survive. Also, with the cost of sophisticated weapons and navigation systems rising sharply, it is doubtful the Army will soon possess sufficient funds to equip its helicopter fleet to fight while flying under instrument conditions. Thus, for the immediate future it appears that survivability of helicopters will continue to be dependent upon the abilities of individual aviators who must be thoroughly trained and highly proficient in all aspects of low level flight.

CPT Steven A. Raho III
RWQC 73-2
Ft. Rucker, AL 36360

Sir:

From time to time in the United States Army the question comes up: "Should there not be an aviation branch?"

This question was again brought up in the DIGEST by Brigadier General William J. Maddox's article, "From Fabric To FLIR," upon the occasion of the 30th birthday of U.S. Army aviation. General Maddox, Director of Army Aviation, gave the answer (which goes back to 1942); *integration* is the key word.

As the German Liaison Officer to the U. S. Army Aviation School/Center at Ft. Rucker, AL, it is not my job to plead for or against a U. S. Army aviation branch. However, I would like to tell you something about our Army aviation branch and why we have it.

First, we did not have Army fliers in World War II. All artillery, aerial reconnaissance and liaison flight missions were flown by the Air Force. As you will recall, the famous Fieseler Storch was one good plane used for such tasks, but there also were others.

In 1956 and 1957, when we had to think about Army aviation, American helicopters in Korea had already made history in golden letters. The time for the L-4 Cub had passed. Very reliable

Continued on page 26

From the Director of Enlisted Personnel

Some of the Army's older aircraft are being sent to the boneyard and people who have the skills to maintain them will soon be out of a job.

If your MOS is one of the following, it is scheduled for oblivion:

67B—0-1/U-6 Airplane Repairman
67C—U-1A Airplane Repairman
67M—OH-13/OH-23 Helicopter Repairman
67P—CH-34 Helicopter Repairman
67T—CH-37 Helicopter Repairman

There are other aviation maintenance MOSs which are now overstrength because of the decrease in aviation units resulting from the phasedown in the Republic of Vietnam. These overstrength MOSs include:

67F—Airplane Technical Inspector
67N—UH-1 Helicopter Repairman
67W—Helicopter Technical Inspector

People who have skills which are becoming obsolete or are overstrengh have two options available to them:

1. There are a limited number of school quotas available for courses in the following aviation maintenance MOSs:

67G—U-8/U-21 Airplane Repairman
67V2T—OH-58 Helicopter Repairman
67X—CH-54 Helicopter Repairman
67Y—AH-1G Helicopter Repairman

If you desire to stay in the aviation maintenance career field and can qualify for one of these schools you should see your personnel officer to request a quota. AR 614-200, chapter 11, outlines the procedures for requesting MOS training courses. Installations are authorized to request quotas by telephone.

2. If you desire to work in another career field, DA will soon publish reclassification guidance listing those fields, by MOS, which are open to reclassification. There will be no reclassification into the aviation maintenance career field in the foreseeable future.

Don't hesitate, school quotas are limited.

THE WAY OF THE FUTURE:

LOW LEVEL

The author discusses the abilities of potential threat armies, together with the devices we now have which show promise as counterweapons . . . he also tells of programs at Project MASSTER and CDCEC which should advance our military posture in the future: improvement in low level navigation training and a night capability until now unattainable

Lieutenant Colonel Donald R. Hull

THE ARMY AVIATOR must be prepared to face awesome threats in the wars of the future. Fortunately, he has already experienced a preview of coming attractions during the Lam Son 719 venture into Laos in 1971. In this operation Army aviation encountered a more sophisticated enemy antiaircraft threat array than previously in the Republic of Vietnam. The Lam Son operation constituted a severe test of aviation tasks and provided an insight into a mid/high intensity conflict.

Warsaw Pact countries possess a broad range of weapons designed to acquire and destroy airmobile forces (see "Soviet Airmobility," September 1971 DIGEST). Currently, the 57 mm S-60 is the basic antiaircraft gun of the Soviet ground forces. It has an effective range equal or better than current U. S. candidate systems when used in the off-carriage mode with radar and associated optical fire control director. Both the 23 and 57 mm guns have fully armored self-propelled versions that are found well forward in threat formations.

The Soviet's ZSU 23-4 self-propelled antiaircraft gun is a four-barreled gun unit which is mounted on a tracked chassis and carries an onboard radar. It can fire approximately 200 rounds per tube per minute with a very lethal antiaircraft standoff capability. To make the situation even more grave, the ZSU 57-2 self-propelled system mounts two S-60 guns on a medium tank chassis which presents an additional highly mobile threat system. No associated onboard radar has been identified with this system.

In addition to the specific weap-

Nap-of-the-earth operation near Ap An Bien Province in the Republic of Vietnam . . . UH-1D hastens across rice fields carrying a strike force for assault

ons mentioned, potential threat armies possess highly effective anti-aircraft missiles "made to order" for engaging helicopters. Studies have indicated that the threat environment constitutes a significant problem of survivability as well as mission accomplishment.

Through extensive research and development activities some items of material show promise in countering the threat alluded to previously. Some of these items provide electronic intelligence-gathering devices which allow the aircraft to locate and either destroy or avoid enemy air defenses. There are devices which suppress the infrared (ir) signature of the aircraft, therefore, reducing its vulnerability to ir directed weapons. Electronic countermeasures (ECM) devices are available which will either jam or deceive the enemy detection systems. These sophisticated items of equipment alone will not solve all of our problems; to have it we must pay a penalty in weight, space and expense. Some of our aircraft that need this equipment most (e.g., the scout light observation helicopter) can ill afford the penalty.

It is, therefore, necessary that we temper sophistication with common sense. It seems reasonable that if an aircraft is more vulnerable to enemy detection and engagement at higher altitudes, perhaps Army aircraft must plan on operating at extremely low altitudes.

Low altitude flying may be referred to as nap-of-the-earth operations. It is difficult to assign a numerical height to this type of flight. However, it is generally considered as clear of trees up to 50 feet absolute altitude. Within this flight envelope the aircraft remains in ground clutter and because of terrain masking (i.e., vegetation and terrain forms) it is extremely difficult for the enemy to detect and "lock on" such a target.

Unfortunately, there are disadvantages to flying in the low level atmosphere. A few of these are:

- Wire and terrain strikes.
- Navigation is difficult.
- Our target acquisition capability is degraded.
- Instrument flight is more hazardous.
- Flight, in general, is more fatiguing.

Let's face it, many commanders are opposed to the establishment of nap-of-the-earth flight training. The primary reason is the fear that the accident rate will rise. The next war is viewed as sometime in the distant future; however, rising accident rates associated with "new fangled" training programs that may lead to the termination of the commander's career and lack of promotion are "real time."

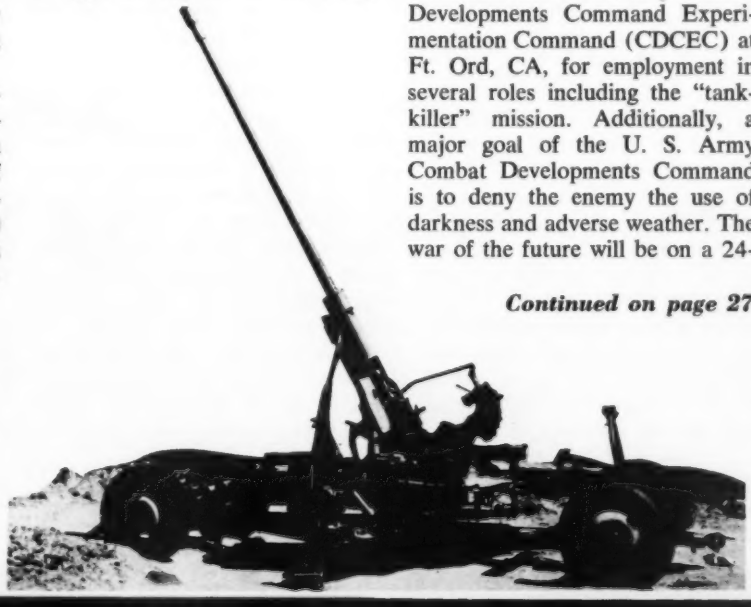
The U. S. Army Agency for Aviation Safety (USAAAVS) has completed an analysis of 836 Army helicopter collisions with terrain obstacles which occurred during calendar year 1969. This study (Technical Report 72-1) included all type helicopters in the Army inventory. Crew error accounted for 91 percent of these mishaps. Less than 20 percent occurred enroute, while over 70 percent occurred as a result of hovering, landing and taking off. The greatest risk appeared to be in hovering and landing. The agents which contributed to crew error were:

- Complacency.
- Fatigue.
- Poor pilot technique.
- Mission requirements.
- Environment.
- Supervision.

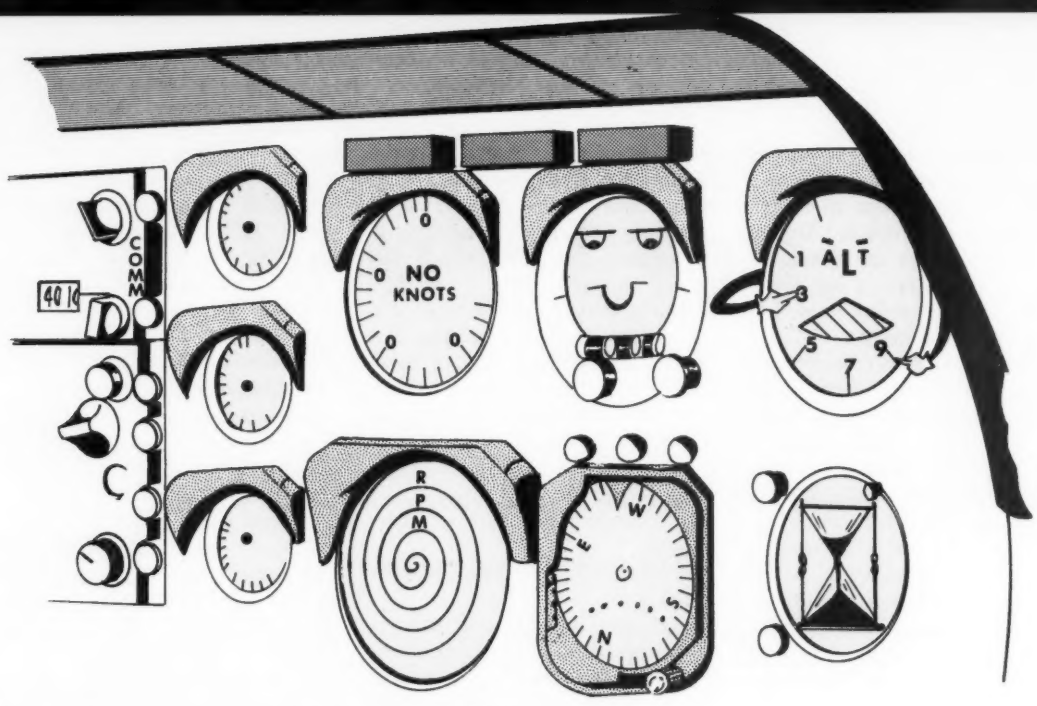
Many experienced aviators and unit commanders feel that the low level hazard is caused by the complacent pilot who arbitrarily elects to make a simulated "gun run" or treetop flight for the thrill and not because the mission required it. The aviator who is not well trained, psychologically prepared or properly supervised has no business operating low level.

Mission accomplishment must remain paramount in planning for the future. Airframe and related systems technology has advanced tremendously in the last few years and appears to be continuing. Aviation research is constantly seeking ways to increase the aircraft's capabilities. For example, the attack helicopter has been undergoing tests at Project MASSTER and the U. S. Army Combat Developments Command Experimentation Command (CDCEC) at Ft. Ord, CA, for employment in several roles including the "tank-killer" mission. Additionally, a major goal of the U. S. Army Combat Developments Command is to deny the enemy the use of darkness and adverse weather. The war of the future will be on a 24-

Continued on page 27



The 57 mm S-60, effective range radar 6,000 meters/2 rounds per second. The self-propelled version ZSU 57-2 mounts two guns and is even more threatening



Instrument Flight WITHOUT Instruments

What can you do when you inadvertently encounter IFR conditions if you are in an aircraft poorly equipped for weather flying . . . the thoughts and techniques given here and applied to your aircraft, fully instrumented or not, may see you through that emergency

Captain Philip G. Carthage

WHAT IS AVAILABLE to Army aviation when the ground is obscured? Why, instruments, of course! But this immediately presents a problem: What is the availability of instrument equipped aircraft?

Experience in the continental United States and particularly in the Republic of Vietnam reveals that IFR capable aircraft are rare indeed or in the best of circumstances missing those essential extras: an operable attitude indicator, a functional vertical speed indicator or a recently calibrated pitot static system, for example.

To the lack of proper instrumentation add the numerous aircraft in the Army inventory that were not designed for flight on seriously cloudy days: the OH-13, OH-23 and that interesting olive on a toothpick, the OH-6A. These are fine aircraft but somewhat lack the wherewithal to handle even small clouds. The helicopter falls more in this category than a fixed wing, therefore, this discussion is limited to rotary wing aircraft.

What does the helicopter pilot do when faced with inadvertent IFR in one of the machines mentioned? Discounting acute panic as a solution, he has to make the best of the situation. Take, for example, the case of one aviator in an OH-13S who departed home base to the south at first light only to discover that a 400 foot ceiling abruptly descended to meet the ground. Even under tactical necessity, penetration of a fog bank has its drawbacks. Add an aircraft without even a plumb bob and the result is instant terror. The solution: an immediate climb using a dull orange orb, the sun, held in the same spot on the bubble (a substitute attitude indicator), leaving the pilot VFR-on-top in a

matter of seconds. An argument could be developed for his lack of judgment on several grounds, but the real crux of the problem is what to do when a mistake *has* been made or when one *is* outfoxed by the weather.

Rather than try to cover all situations and types of aircraft, let's take a look at one particular model, the OH-6A, and attempt to extrapolate some general principles applicable to all possibilities.

The popular OH-6A's equipment and design make IFR operation inadvisable. Before getting too deeply immersed in detailed instructions, consider these basic facts:

- For inadvertent IFR the technique involved requires instrument proficiency well beyond what is required in a UH-1.
- Any resort to instruments in an LOH can be classified as a serious emergency.
- The purpose of any maneuver is a return to VFR as quickly as possible.

In straight and level flight the objective is to maintain a constant altitude and heading. The torque or power setting should remain constant and the aircraft in trim (established by using the ball and needle or by holding the previously stable pedal setting). The pitch attitude will be determined from the air speed indicator; e.g., air speed slowing indicates a nose high condition, air speed accelerating indicates nose low. The optimum air speed is the cruise air speed; no attempt should be made to change it even when the manual may suggest otherwise. The objective is to reduce to a minimum the number of changes made in transitioning to instrument flight. A maximum air speed change of plus or minus 5 to 10 knots should be used to correct for altitude errors.

In most LOH aircraft the attitude indicator is marginally reliable and should be treated only as an indicator of the direction of change in bank. This idea can be applied to other aircraft where the attitude indicator is precessing; usually it will still indicate movement around the roll axis of the aircraft though roll has stopped.

Knowing the instruments and what can be expected from them cannot be emphasized enough. A constant heading can be maintained with reference to the attitude indicator and with heavy emphasis on an indication of turn on the radio magnetic indicator (RMI). An unreliable attitude indicator also may show the vertical within 5 to 7 degrees in the OH-6A, a source of information that should not be discounted in an emergency.

Climbs and descents are accomplished maintaining wings level and a constant heading as discussed above. Do not attempt to change to a climb air speed; maintaining the cruise constant allows continued use of the air speed indicator as the primary pitch attitude instrument minus errors caused by intentional air speed changes. Again, we are applying the principle of "minimum change" in accomplishing the maneuver. Prior experience with the aircraft should tell the pilot what power adjustment is normal for a smooth, even climb or descent. For example, a 9 to 10 pounds per square inch (psi) change in an OH-6A

Continued on page 29

Inadvertent IFR in an LOH

. . . requires instrument proficiency well beyond that needed in a UH-1

. . . any resort to instruments can be considered a serious emergency

. . . the purpose of any maneuver is to return to VFR conditions

GROUND SAFETY

NOMENCLATURE: TRACTOR, WAREHOUSE

Major Rodney C. Lindsey

Call Names: Tug; Airfield POV; Work Escape; Hot Rod

Applied Uses: Transportation across airfield; distribution vehicle; step saver; a place to forget everything; something always out of gas; dragster

Designed Use: Ground handle aircraft

As of yet, science hasn't developed a time machine to take man back or forward through time, but the Army has. It doesn't have a fancy name or appearance, but is usually quite reliable. It's commonly called a "tug."

For some yet unexplainable reason a man usually goes into another time frame when he crawls behind the steering wheel of a tug. There is an almost instant transformation from a dependable mechanic to a high-spirited cowboy. His "mount" then is capable of high speeds with little or no driver attention required, even when going backwards. He doesn't have to worry about feeding, cleaning or taking care of it for as soon as he dismounts somebody else will mount it and speed away.

Consequently, it soon halts for lack of food, hobbles because of a loose shoe and eventually dies at an extremely young age for lack of proper preventive care. The rider's final thoughts, "So what, we'll get a new one."

A thought of the cost of acquisition for a new one ($3,000) never enters his mind, for next time he needs a "mount" surely one will be there.

Too weak

Objects in mouth

Poor mike technique

Hesitant - indecisive

Phrasing

Articulation

Excessive transmission

WHO WHAT WHY?

"SAY AGAIN, you're coming in broken!"

"Say again, you're unreadable!"

"Say again, you're garbled!"

"Say again! Say again! Say again!"

How many times have you been involved in a lift that could have gone off like clockwork, only to be foiled by pilots not using good radio procedures?

Too many people want to get their 2 cents worth in when they should be listening. Chances are that if pilots monitored those radios, 50 percent of the radio transmissions wouldn't have to be made.

Anyone who has been mission lead or flying command and control or fireteam lead knows what I'm talking about, because he knows that the most difficult part of any lift is control of assets, slicks, guns, hooks, etc. The only way to control assets is on the radio.

There's always the joker who keys his mike and it sounds as if he's tuning up for operatic aria. You've heard him . . . Ahhhhhhhhh! Lead, this is Ahhhhhhh Chalk Uhhhhhhhhh (he's counting) five mmmmmmmm.

Then there is the guy who wants to tell the whole world how short he is. That isn't too bad back at the hootch or the club, but certainly not on guard. "Attention world and all the ships at sea, Peter Pilot has 361 days." This only takes 10 seconds to say but during this 10 seconds his buddy might be on the ground someplace trying to establish voice communications with a recovery aircraft and the batteries in his survival radio are getting weaker and weaker.

Solution? I recommend what I call the *Who? What?* and *Why?* method of radio procedures.

- **Who are you calling?**
- ***What* are you going to say?**
- ***Why* are you calling?**

Aviators who implant these three words in their minds—and know the answers prior to keying that mike—are not cluttering the airways with needless babble.

By the way, how's your telephone etiquette? Do you know *who* you are calling about *what* . . . and *why*?

Overemphasis

Loud

Vocalized pause

Rate too fast

Monotone

Anger in voice

Rate too slow

Dialect

Voice trails off

Pitch too low

Pitch too high

Pronunciation

Voice quality

Can You Remember What An Autorotation Is ...*Really?*

Standard autorotations taught us the basic mechanical reactions of pitch down, right pedal, etc. We learned of reaction time—ours always too slow—and we became aware of things like air speed limitations, trim, deceleration and prior planning or anticipation. Remember also those frequently reassuring words, "I've got it!"

Captain Gary W. Wing

IT'S BEEN SAID that an autorotation is what a helicopter pilot carries with him instead of the parachute that his starched wing counterparts have for confidence builders. It must be nice when you're running out of altitude, ideas and air speed to nonchalantly step out on the wing, wave goodbye and then give the airplane back to the taxpayers.

Fixed wing types also have another advantage; that is, their parachutes are checked and repacked every 60 days. How many days has it been since you have done a touchdown autorotation. . .20. . . 40. . .180? In other words, how long has it been since you really evaluated what you know about your "parachute"?

In flight school a student performs "standard autorotations." He enters into the wind or direction of traffic at about 700 feet above ground level (AGL) by simultaneously lowering pitch full down, rolling throttle to flight idle, establishing the aircraft in trim normal rate of descent, and then checking and calling out rotor and gas producer. At 100 feet AGL the aircraft is at about 70 knots, in position to make the intended touchdown area and the student begins decelerating. At 10 to 15 feet, pull initial pitch and then cushion at about 1 to 3 feet. This should bring back fond memories of bouncing merrily

down lane six. Remember also those reassuring words, "I've got it."

Standard autorotations taught us the basic mechanical movements of pitch down, right pedal, and so on. They taught us that reaction time was required to be fairly quick because a helicopter does not glide like a fixed wing but like a terrified man who forgot his chute and is flapping his arms on the way down. Other lessons standard autorotations teach cover:

Rpm—if varied within operating limits (do you remember those limits?) we can *shorten* with high rpm, but it increases the sink rate. We can *extend* with low rpm and that decreases the sink rate. That just means pulling a little pitch.

Air speed — (remember those limitations for the aircraft you fly right now?) high air speed (within limits) *extends* glide and increases rate of descent; low air speed (within limits) *decreases* glide and decreases rate of descent.

Trim—(remember right pedal?) out of trim increases rate of descent to the point you can go right by that poor guy flapping his arms.

Deceleration — moderate extends and abrupt shortens the glide. However, a real tail low deceleration brings up two critical possibilities. First, after having taken effect a student is suddenly in a very high rate of descent which on hot, calm days with a loaded aircraft has a tendency to modify the function of the skids into very elaborate armrests, which is how an explanation would have to be—*very* elaborate. Second, in that extreme tail low attitude the tail stinger has a tendency to contact the ground before the rest of the aircraft. What would happen if your forced landing is into mud or shallow water? Remember to get your story straight before the investigation board arrives.

Anyway, we have the mechanics down for a "standard." Now consider the forced landing which is a valuable structural member of our present day "parachute." One of the mind-shattering aspects of this training phase is that engine failures do not always happen while heading into the wind. Upon turning into the wind and toward a suitable touchdown area another factor affecting an autorotation comes up: *turns*. In an autorotative turn, rate of descent increases in proportion to degree of bank. And remember, it's always profitable to adjust the enroute flight path so it includes forced landing areas.

Now, let's progress to an aerodynamic analysis of an autorotation. In powered flight the blade disc has a stall region around the hub area and most of the remaining blade area produces thrust. Upon entering autorotation the air flow reverses, with relative wind now coming up from below and in front of the helicopter. The hub area of the disc again produces drag.

About the center one-third of the autorotative region catches the relative wind and drives the blade, supplying a certain amount of centrifugal force. This amount is dependent upon several factors. First, the weight of the helicopter; the more effect gravity has on the aircraft, the higher the rate of descent and consequently the more force is applied to the autorotative region by an increase in velocity of relative wind. A second factor is the angle of attack of relative wind. Therefore, if you turn or decelerate during autorotative descent, you increase the angle of attack and thereby increase rotor rpm.

The outer one-third of the rotor disc or propeller region is the equivalent of the falling man's flapping arms. That is, they produce some lift to slow the rate of descent.

The amount of lift produced by the propeller region is dependent upon the amount of thrust supplied by the autorotative region. During autorotative descent the two regions are in a steady state because the drag induced by the propeller region and the hub area keeps the autorotative region the same size. This works up until the air speed and rpm limitations we all remember are violated. At that point the autorotative region collapses and turns into drag and the helicopter begins to take on aerodynamic characteristics similar to a soft drink dispensing machine.

Another point to reconsider is that the autorotative region also collapses at the time you go below critical air speed just before pulling initial. At that point the only motivator turning the blade is inertia. If you don't put in enough initial, you can pull in some more—up to the point where you run out.

If you put in too much initial, and instead of slowing your descent you are suddenly ballooning back into the sky, stop and and think. A predictable reaction would be to lower pitch slightly. That would increase rate of descent and cushioning pitch would probably require magic to effect a smooth touchdown. Centrifugal force is substantially reduced. Therefore, lowering collective increases descent rate and a subsequent pitch increase provides minimal lift. The right way then would be to leave the collective in the position that started the ballooning upward. Shortly (because of rpm loss) the aircraft will begin to settle and the little bit of pitch remaining will be adequate for cushioning pitch.

How about a hovering autorotation? Can you remember why a slight amount of right and forward cyclic is necessary to make the aircraft descend vertically without drifting? How about translating tendency or the tendency for a

Continued on page 23

. . . I spotted his flight of three to our left front approaching the field heading generally west; we were heading 210 . . . things became rather confused at this time. Whether his flight turned, or mine, is an undetermined point but all of a sudden . . .

I F R AT TAC-X

Captain Kenneth J. Cole

"CAIRNS APPROACH control, Playboy 1-1, over."

"Playboy 1-1, Cairns approach control."

"Cairns approach control, Playboy 1-1 is inadvertent IFR, approximately 5 miles north of Samson, AL, at 2,800 feet in a right-hand 360; request full-stop GCA to Cairns Army Airfield. Negative transponder."

"Roger, Playboy 1-1, turn left to a heading 030 degrees for positive radar identification."

The GCA that followed concluded the most harrowing evening that I have spent recently. I hadn't realized that those bright green approach lights at Cairns 06 runway could look so good. I must give my student due credit; he flew the whole GCA. It's kind of hard to fly actual instruments from the left seat of a UH-1D.

Reconstructing the whole thing it seemed like an unlikely sequence of events, all considered. I didn't even have students in this class at the U. S. Army Aviation School, Ft. Rucker, AL. I had been called in that afternoon to fill in for another instructor pilot (IP) who was sick. The mission was less pleasant than most: operations order 91, an IP demonstration of night formation techniques. Our training syllabus calls for 30 minutes of flight for each of our students, so the entire mission usually lasts just about 2 hours. As it turned out only one student got to fly at all.

This particular night the weather was less than cooperative from the beginning. We had just enough ceiling and visibility to go, but rain was forecast and the ceiling forecast to drop. We sat through two 30 minute weather holds and the mission was finally scrubbed. However, all aircraft still had to be ferried back to Lowe Army Airfield at Ft. Rucker since Long Binh (Tac-X) is out in the field.

I was to lead the first flight of three back up the Tac-X access route to Lowe AAF, so I lined up the flight in a "V" formation. Playboy 16 (the first platoon leader) was on my left wing, Playboy 17 on my right. As we departed Long Binh I heard the second flight of three

call for lineup instructions. We then switched to our company UHF frequency. Playboy 13 was leading the second flight of three.

Flying back toward Enterprise, AL, and Lowe AAF the ceiling was dropping steadily. The published access route altitude was 1,100 feet, but we were holding about 800 feet to stay VFR. Even at that altitude we were encountering patchy clouds, but we were able to maintain integrity in the flight.

About 5 minutes out of Enterprise one of the operations officers (who had departed a few minutes before our flight) called over our company UHF to warn all aircraft to turn back to Tac-X; Lowe AAF was now IFR. Here the fun started. There were at least three flights of three on the access route inbound for Lowe. We made a 180 and started back to Tac-X.

We were now down to 700 feet indicated in order to stay VFR and were encountering more clouds and could see ground fog forming in depressions. We switched back to Long Binh UHF and on platoon FM I tried to find out the location of the other flights of three. They knew about as much as I did: the heading back to Long Binh NDB—not much help. Playboy 13 was being vectored by another aircraft in his formation by this time as he had lost his radio magnetic indicator and automatic direction finder.

Playboy 13, who was in front of us, called for landing first. Long Binh, reporting VFR, told him to land on runway 14. I spotted his flight of three to our left front approaching the field heading generally west (we were heading 210). Things became rather confused at this point. I heard several conversations between his flight and the tower, none of which registered. Whether his flight turned or mine is an undetermined point, but suddenly we were on a collision course.

Landing and staying VFR were now number two and three on my mind; we had to stay clear of that other flight. We were too low to go down. We climbed to about 1,000 feet indicated, cleared the flight of three, and started to go into solid clouds, so we descended back to traffic pattern altitude. I asked the tower for permission to report beacon passage (southwest of the field) and land on runway 14. The tower "rogered" me and told me to report the beacon and a right base leg. I heard Playboy 13 report left base for runway 14 at this point.

We flew on for about a minute toward the beacon and, just as we were about to get station passage, here comes Playboy 13's flight of three once again—this time at 4 o'clock (I was flying; my student saw them coming). Then at 700 feet indicated we ran into a solid wall of clouds.

Playboy 16, on the left, broke down and left and came out of the clouds. Playboy 17 broke straight down, came out of the clouds, saw he was on final to a likely looking field and landed. We climbed straight out into the soup with the student at the controls. Playboy 13's flight landed—but on runway 32, not 14.

Playboy 15 called to tower to say that he was landing. The tower asked him which way and he said he didn't know but that he had an "H" in sight. I wondered where he came from; I hadn't heard from him all night. (I learned later that he was in Playboy 13's flight and had had enough.) All of this time the tower was claiming the field was VFR. Maybe it was, but clouds kept getting in the way. And I wasn't coming down out of those nice safe clouds for anything.

Playboy 16 had landed at Long Binh by this time, after low-leveling around Samson; 17 was still in his peanut patch. He then followed 16's example and low-leveled back to the field. We were the only ones left in the air, now at 2,800 feet over the field.

At 2,800 feet we weren't really VFR, but not IFR either; no clouds. I would guess we were flying between two cloud layers, but it was like flying in the proverbial pit. Since we were the last ones left in the air, I thought we might make one more try at the field. I called the tower and asked for their ceiling. The tower said it was too dark to tell. I said thanks but no thanks, and we headed for Cairns AAF and a full-stop GCA. No fewer than four other Playboy aircraft running on the ground wished me luck.

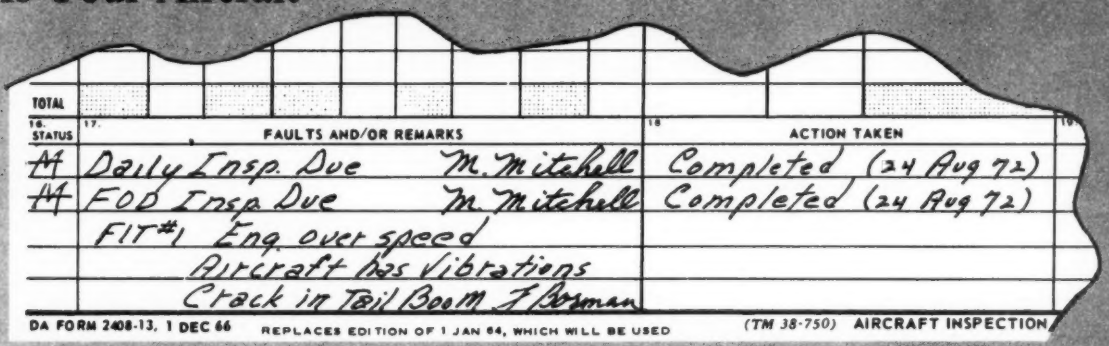
The GCA itself was uneventful, save for passing over the outer marker. I know that horrible green flashing light must be powered by at least a 100 watt bulb. Next to that the worst thing was wandering around Cairns AAF looking for a parking spot. Ground finally parked us next to a medevac UH-1 (I was glad he wasn't running). To cap off the evening we hitched a ride back to Lowe AAF in an ambulance.

Were there any lessons learned? Yes, at least one—the next time I'm scheduled to fly operations order 91, I think I'll remind that other IP who was sick that he owes me one.

Is Your Aircraft

Mission Ready?

Captain Edwin M. Savacool



TOTAL			
16. STATUS	17. FAULTS AND/OR REMARKS		18 ACTION TAKEN
M	Daily Insp. Due	M. Mitchell	Completed (24 Aug 72)
M	FOD Insp Due	M. Mitchell	Completed (24 Aug 72)
	Flt #1 Eng. over speed		
	Aircraft has vibrations		
	Crack in Tail Boom J Berman		

DA FORM 2408-13, 1 DEC 66 REPLACES EDITION OF 1 JAN 64, WHICH WILL BE USED (TM 38-750) AIRCRAFT INSPECTION

THE ONLY FORMAL communication link between maintenance and aviators is DA Form 2408-13. This is an invaluable tool for all maintenance personnel. Improper or incomplete use of these forms cause many maintenance delays while proper use speeds up maintenance.

Too often -13 lists have such entries as

Flt #3 — The head is broken; fix it.

Flt #1 — Aircraft has vibrations.

Flt #2 — Radio inoperative.

Flt #1 — Engine weak.

Flt #4 — Crack in tail boom.

Vague writeups add many extra hours to the time required to repair an aircraft. A general entry only adds confusion. When a deficiency or fault is found, make the entry promptly. This will enable you to describe the problem more accurately, especially if it occurred while inflight. Specific descriptions eliminate many unnecessary hours of troubleshooting and searching.

If a problem is detected inflight, give all the circumstances. If, for example, a 1:1 vertical vibration is noted during low power descents, be sure to mention the low power descents. Don't just make the general entry of 1:1 vertical vibration. If a loss of power is encountered during takeoff, enter the readings on all engine gauges at the time rpm is lost to include altimeter and outside air temperature (OAT) readings. The importance of complete and accurate entries on the DA Form 2408-13 cannot be overemphasized.

A searching preflight can save many agonies in time. To ensure a complete preflight use the procedure outlined in the operator's manual for the aircraft. If you are not familiar with some component or operation of the aircraft, ensure that you do become familiarized with it. When a component looks faulty or improperly installed, notify qualified maintenance people. Be sure that corrective action taken *is correct*. If there is any question in your mind, ask the maintenance people to back up the action they've taken with the maintenance manual; never fly an aircraft you think is not 100 percent ready.

A complete preflight many times unveils problems that would show up during the flight. These undetected problems can cause the curtailment of a flight and an unnecessary recovery mission for maintenance. Most aircraft recoveries are caused by problems that should have been detected prior to takeoff. Bearings do not develop excessive play in less than 1 hour of flight. All too often an aviator will rush his preflight to make a required takeoff time. Upon arriving at his destination he may have a few extra minutes so he will shut the aircraft down and take a closer look. This time he can easily find one or more grounding conditions that should have been detected prior to takeoff.

Occasionally the argument is presented that nothing wrong should be found during preflight; these faults should have been found by the maintenance people. However, it is impossible for the crewchief to always find every one of them. Being human he is not infallible, and one day he may overlook or even cause a major problem. The requirements placed on some crewchiefs are tremendously taxing. There are

times when his aircraft takes off before dawn and returns well into the night. This means that the crewchief must perform his daily inspection after dark, too often without proper lighting. In addition, he has probably been working for more than 12 hours. Under these circumstances it is easy to overlook a deficiency.

An important portion of the preflight is checking the aircraft log book. All red X conditions should have been corrected and inspected by a qualified maintenance supervisor or technical inspector. Nearly every aviator carefully inspects the -13, but few check DA Form 2408-14 and -18 also found in the log book. The -14 is a record of uncorrected faults. No grounding condition should be entered here. If one is, bring it to the attention of the maintenance supervisor. Check the -18 to make sure all scheduled inspections have been made and the crewchief has taken oil samples that are due. The oil analysis program has proven itself an invaluable aid in detecting premature failure of oil-soaked components.

Ensuring serviceability of the aircraft does not end at the preflight. Follow starting and runup procedures stey-by-step as outlined in the operator's manual. If a fault is noted during runup, enter it on the -13. Every piece of equipment needed in the mission should be working properly before takeoff.

Engine analytical checks have recently been implemented by aviation units. The accuracy of these checks is dependent upon the aviator flying the aircraft. It is important to understand the significance of these checks and how they should be performed. Always perform the check at the frequency established by the maintenance unit. If there is an occasion when you have been unable to accomplish the check, admit it! Don't log fictitious figures which can cause wasted maintenance manhours. Take time to talk to the unit maintenance officer about his engine analytical program. He can explain the method he uses to record the data you compile. The value of the program is entirely up to the individual aviator and the accuracy of the information he supplies.

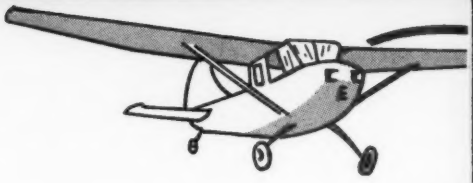
It takes a man with a lot of true professional pride to admit he has made a mistake. Overspeeds, hot starts, hard landings and other aircraft limitations which are exceeded by the pilot must be entered on the -13. Unless inspected by maintenance personnel the results of the exceeded limitations may go undetected until an inflight failure occurs. It is only common courtesy to your fellow aviators to inform maintenance of these occurrences.

It also takes a lot of professionalism to perform a complete postflight inspection at the end of a long day. This is the time to really help maintenance. Remember the crewchief has worked the same hours you have and in some cases even longer but he still must begin the most important daily inspection. This is the time for the aviator to give his ego a little workout so that maintenance personnel and the aviators who fly the aircraft the next morning know that the aircraft will be ready to perform. Check the -13 to make sure all necessary entries and faults have been recorded.

The most important thing you should do before going home is to give the crewchief a "thank you" for what he has done for you. A letter of appreciation or commendation from an aviator goes a long way in developing pride and confidence in a crewchief. It makes him strive to improve his performance. Just as it is important to tell a crewchief that he is not performing his duties properly, it is also important to reward him for his extra efforts.

Situations often arise when a direct line of communications between pilot and maintenance officer is desirable. If you notice a trend of difficulties arising, it is best to talk directly to the maintenance officer. Ask him to show you around his operation. He will be more than happy to accommodate you. In this way you can become more familiar with the things he does. It may even eliminate any apprehensions that may have arisen in your mind. Feel free to make suggestions. Many helpful hints have been given to maintenance by aviators. Tell the maintenance officer about particular problems you have encountered with certain aircraft and personnel. Remember, he cannot fly or inspect every aircraft in his fleet; he must obtain his condition reports from you.

Good maintenance is not the sole responsibility of maintenance personnel. The pilots who fly the aircraft contribute greatly to the maintenance effort. If the aviators take no interest in proper maintenance, the mechanics cannot be expected to have any pride or concern in their aircraft. In any unit you are the core of the operation. Every time you fly, remember your obligation to maintenance and those who work to ensure you a safe return home.



One Man's Way

. . . just about now a strike aircraft on call would be a salvation . . . breathless from trudging over the jungle floor the company commander took a small radio from his pocket . . . the initial call resulted in not only artillery but also eighteen jet aircraft with 20 mm cannon and napalm and four helicopters armed with M-79 grenade launcher

MAYDAY . . .

Major Burnum E. Melton Jr.

THE JUNGLE STENCH was heavy in the nostrils; the footing was slimy, sucking and uncertain with the muck becoming deeper as the company trudged deeper into the dank interior of the Republic of Vietnam. The jungle canopy was unyielding in its refusal to admit either light or breeze to grace the relentless pursuit of the wily Viet Cong (VC).

After seeming hours in the grass hell of dense jungle mire, the company's lead element broke out of the jungle cover into a clearing through which the company had to pass. Halfway across the clearing the company's lead squad came under fire from a VC machine gun delivering fire too heavy for an immediate assault into the gun. Still in the jungle the main body was receiving sniper fire, denying significant movement of reinforcement forward.

"Just about now an aircraft with some hip pocket artillery or strike aircraft on call would be salvation," thought the CO. With anxious eyes he scanned the sky and horizon for any sign of an aircraft.

Breathless from trudging over the jungle floor to reach his beleaguered vanguard, the company commander took a small radio from his pocket, extended its built-in antenna to full length and spoke into the built-in microphone/earphone. "Mayday, Mayday, this is Fire Ball 6 listening 38.0 on FM transmitting 32.4—over."

An O-1 pilot conducting a surveillance mission in the area heard the call on the guard frequency of the aircraft's UHF radio. The pilot immediately tuned his FM radio to the frequency that the ground commander was using for transmissions while the aerial observer tuned his radio to the receiving frequency. Contact with the ground commander through the FM radio was immediately accomplished.

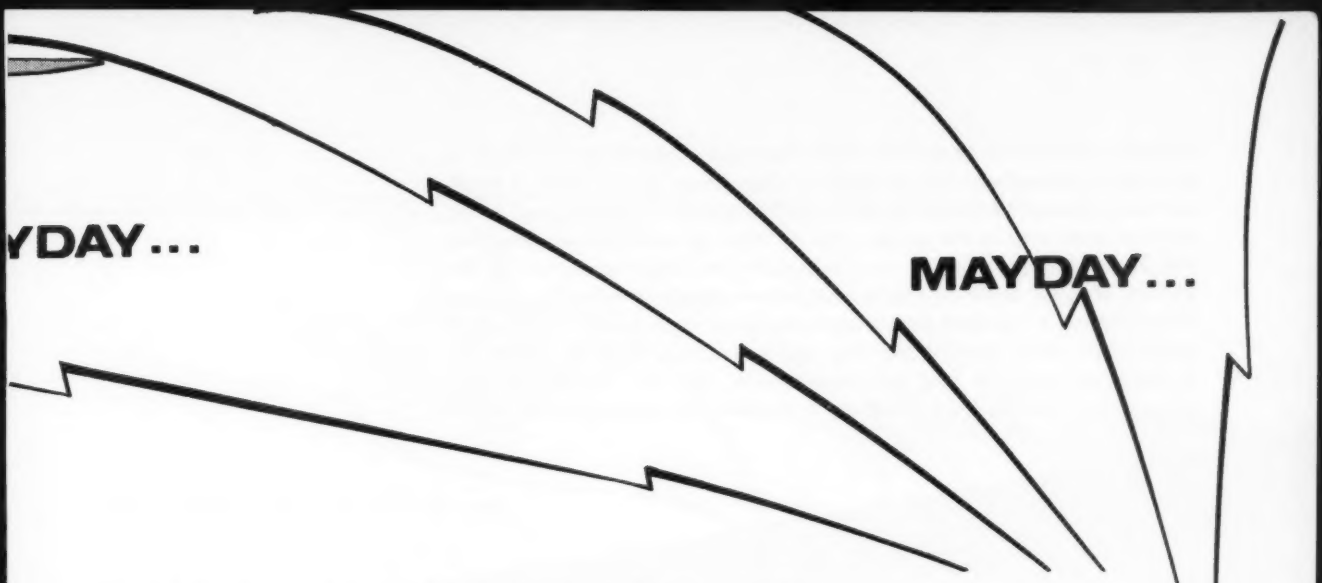
The initial radio call sent by Fire Ball 6 resulted in not only artillery but also 18 jet aircraft with 20 mm cannon and napalm and four armed helicopters armed with the M-5, better known as the automatic M-79 grenade launcher. By making initial contact with a UHF emergency type radio over the O-1 radios' guard frequency, the Infantry commander arranged in one transmission the capability of break-in operation and clear ground-to-air communications by use of the FM radios.

Since most FM radios currently in the field do not have a guard channel capability, the next best system of immediate ground-to-air communication is ETICON — *emergency tactical initial contact.*

ETICON, as a system, is no more than the technique of using an emergency radio (URC-4, URC-11, URC-10) to establish initial contact over aircraft emergency frequencies and the coordinating operational frequencies for FM radios. No platoon sized unit with sufficient artillery and aviation support need fear being cut off or overrun. Likewise, no platoon sized unit with operation emergency type UHF radios should ever lose radio contact since emergency frequencies are monitored 24 hours per day by all Army and Air Force aircraft.

Replacement of the present family of Infantry radios with radios possessing a guard channel would be prohibitive due to the cost. The ETICON system would be an adequate stopgap until such time as the Army's development of a new family of radios with a separate guard channel for FM is completed.

Fixed wing aviators have no franchise on instant reaction to the call for emergency tactical support. Quite the contrary. On several occasions helicopter pilots, having made prior arrangements with supported ground units through loans of emergency radios to ground units, have been able to conduct ordinary operations sup-



porting their primary missions and at the same time maintain a listening watch over the entire battlefield by monitoring their UHF guard channel.

ETICON's tactical value is evident, but what about ETICON's operational merits? The nucleus of the system—the emergency radio which is light, compact and possessing either UHF or VHF capabilities—has a probable maintenance life exceeding that of the Infantry's FM radios. The useful life of the mercury battery attached to and supplying power for the URC-10A is 100 hours. The planning range of the radio is 20 to 35 miles line of sight. The radio's signal will penetrate dense jungle foliage adequately to contact aircraft within a 3 to 5 mile radius, as proven time and again by Army and Air Force aviators using the URC-10A in its primary rescue role. This radio does provide emergency contact for downed aviators quite successfully.

The role of the emergency radio in an ETICON system can be more than adequately fulfilled by either the URC-10A, URC-4 (a dual channel VHF and UHF radio), URC-11 or the URC-14. All of these radios are now in the Army and Air Force supply channels in sufficient number to support an initial test element for the ETICON system without overtaxing the supply system.

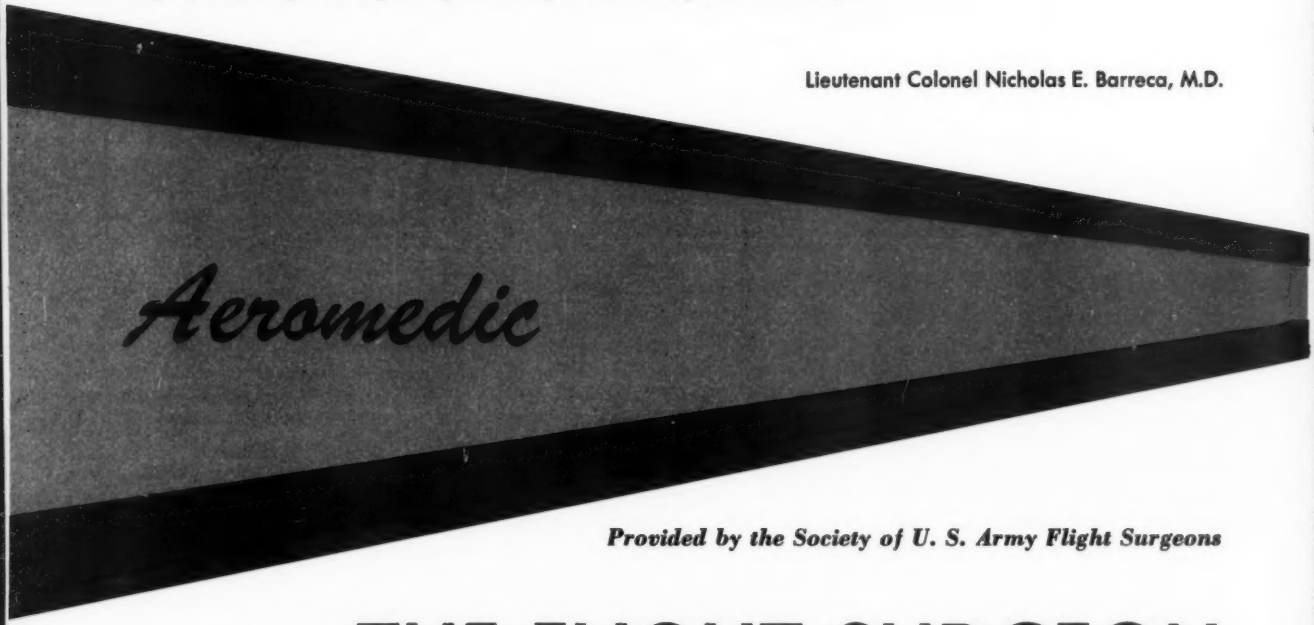
Operational and tactical aspects of ETICON are well within the now possibilities of application. However, what can be done toward solving the problem of training for field units in the correct use of the radios and the system? How can distribution of the URC-10 (or suitable substitute radios) to the units in the field be rapidly affected and down to what level? ETICON training can be conducted on an integrated basis with other field training. A 1 hour class covering the operation of the radio and a description of its capabilities and limitations climaxed by a brief description of the ETICON call and procedures to follow in making the call would be the full extent of formal classroom training. Further training would involve only the practical application of ETICON during the conduct of field training.

Distribution to the field units should be effected down to platoon level. The frequent requirement to operate independent of parent units often places the platoon out of range of company supporting fires and radio reception. ETICON is then an essential addition to the voluminous list of equipment necessary for any combat operation by the platoon.

After many words of description, explanation and discussion of ETICON, one may begin to wonder if all these changes, training and supply upheavals would really be worth the time and effort. But then we must remember the lessons learned in Vietnam. We must remember either our own experiences or the times when a unit called in vain over empty frequencies for support that never came. We must ask ourselves: What is the cost of 76 lives? What is the value of the combat power and professional know-how contained in two Infantry platoons? How is success in battle measured against dollars and cents or hours of work and research? There is no measure. There is only the omnipresent *demand* for better and more efficient systems and weapons with which to combat the enemies of our country. ETICON is needed *now!*

Aviation medicine is something more than just a physician cloistered in the sterile atmosphere of a hospital or dispensary. It is a form of medicine that goes to the people it serves and deals with potential and actual medical problems in the perspective of *their* operational environment. The flight surgeon must be well informed and experienced in all the aspects of Army aviation's man-machine-environment complex of interrelationships. In medical school and internship a physician learns much about man. Only through training and experience does he get to appreciate the machine and the environment. For this reason all flight surgeons are required to participate in *regular* and *frequent* aerial flights

Lieutenant Colonel Nicholas E. Barreca, M.D.



Provided by the Society of U. S. Army Flight Surgeons

THE FLIGHT SURGEON

To the air crewman: Not infrequently the question arises: Why does the flight surgeon fly? Is it merely to justify his title or flight pay? He certainly doesn't perform inflight surgical procedures, nor does he often treat his patients in flight. Why doesn't he confine his duties to hospitals or clinics? Certainly there is no overabundance of physicians or their assistants. These questions are often expressed by hospital commanders or clinic chiefs. Regrettably they are sometimes thought, if not asked, by aviation commanders and/or other air crewmen.

The answer is simple. The flight surgeon is, or can be, the major bulwark against fatigue and the stresses of the aviation environment. Only he knows the combined physical and psychological capabilities and limitations of man's performance. With this knowledge and his experienced awareness of the air crewman's duties and activities, he can maximize performance and efficiency as well as minimize unnecessary injury, disability and death.

Let us then examine some of the reasons for regular and frequent aerial flight by the flight surgeon.

• *To recognize and understand the multiple stresses to which air crewmen are exposed.* Initially the flight surgeon is taught the basic fundamentals and principles of fixed and rotary wing flight. Only through continued experience can he fully appreciate and survey the interface that exists between the demands and consequences of flight and the capabilities and limitations of the air crew. He must be allowed to study the spe-

IN FLIGHT . . .

cial stresses imposed upon Army instructors and student pilots during their training as well as their later operational utilization.

• *To enable realistic aeromedical dispositions.* How does a flight surgeon decide who is qualified or disqualified for flight without an intimate knowledge of the demands of flying in Army aviation? The medical standards regulations are generalized guidelines but each air crewman is an individual. Waivers are granted to individuals based on the principle of adaptation. Without a knowledge of flight the success of adaptation cannot be realistically evaluated.

• *To ensure the application of human factors design principles.* Initially the flight surgeon is taught the requirements for human factors design engineering in the operation of fixed and rotary wing aircraft. He must continually see that these principles are applied and look for new areas of difficulty. He must appreciate the needs for aircraft and pilot responsiveness, for integration of the pilot's senses and abilities with aircraft instruments and controls, and for protection of air crew for health and safety.

• *To enable sound aircraft accident investigation.* The flight surgeon must contribute knowledgeably to the investigation of aircraft accidents, particularly with respect to human factors design and safety. He must also determine the extent to which the physical and emotional capabilities and limitations of pilots may have contributed to accident causation. To accomplish this the flight surgeon must be familiar with Army aircraft, their missions and characteristics, the

pilots, their training and capabilities, and the conditions under which they fly.

• *To survey the application and utilization of health and safety principles and procedures and the use of protective life support equipment.* Only through surveillance and correction can any preventive program of health and safety be successful. Only by actual participation in flight can the flight surgeon truly survey his area of responsibility. Often by his responsible participation he sets the example for the utilization of these principles, procedures and equipment.

Thus, one can see there is ample justification for the flight surgeon's participation in flight. What then is done to ensure that such participation will be fruitful. To be fruitful flights must be deliberate and eventful. In training the student flight surgeon receives academic instructions on aerodynamics, navigation, weather and aircraft operational utilization. He is then given limited flight instruction by an instructor pilot in rotary wing aircraft. The certified specialists in aviation medicine often undergo a more extended course of flight instruction in military fixed and rotary wing aircraft. Since these officers will be ultimately responsible for the conduct of the entire Army aviation medicine program, it is only natural that they have a full appreciation of the inflight requirements of the air crewman. It is through such training and experience that the flight surgeon can fully contribute to the research, development and application of improvements in air crew performance.

But what about after or between specialized training? What opportunities might the flight surgeon have to ensure that flight will be a useful experience? This must be the responsibility of the aviation commander and individual air crewmen. The following suggestions are offered:

• Schedule meaningful flights for flight surgeons. You train air crewmen in flight, so do the same for the flight surgeon. Do not simply bore holes in the sky or fly around the flagpole to get him "his 4 hours." Show him the capabilities and limitations of the aircraft.

• Fly mission profiles. Show him what the operational mission demands of the aircraft and the air crew.

• Expose him to real or staged mission and environmental stresses within the confines of safety.

• Educate him on aircraft characteristics, missions, control requirements and design limitations. Invite him to operational briefings. Invite his comments about corrective measures or suggested programs.

• Expose him to different air crewmembers, aircraft types and series, and flight conditions; i.e., day, night, instruments and weather. Don't make it easy for him to play favorites. He must be able to speak intelligently about all the air crewmen he serves and their varied machines.

A little effort by commanders and air crewmen in this regard will reap them many benefits. By helping to train the flight surgeon, they will increase the likelihood that he can recognize their problems and effectively intercede before catastrophic consequences supervene.

Department of the Army has recently embarked upon a training program for tactical nap-of-the-earth (TNOE) flying. This is an extension of low level flight that permits aircraft to operate at absolute minimum altitude, taking full advantage of terrain protection. Such flying is admittedly more stressful and embraces an additional degree of risk, requiring an even greater degree of caution and supervision. More than ever then, the flight surgeon may be engaged to monitor the health, safety and protection of the air crew. He can learn to recognize the early signs of skill fatigue which may compromise mission completion and success.

To the flight surgeon: All designated aviation medical officers (AMOs), flight surgeons (FSs) and senior flight surgeons (SFSs) must meet the 4 hour monthly finance requirements to receive flying pay. More importantly, they must meet the proficiency flying time requirements stated in AR 600-106. It is these requirements that were philosophically discussed above.

Remember, even an AMO has to meet minimum semiannual requirements of 6 flights and 24 hours (12 flights and 48 hours annually). This proficiency requirement should not be confused with the flight experience (100 hours and 1 year) required for FS designation. FSs and SFSs have the following proficiency requirements:

	Hours	
	Semiannual	Annual
XC	7	20**
Night	5	15*
Total	30	80

* 5 of which must be cross-country (XC).

** Includes night XC.

Again this must not be confused with the minimum 700 hours and 7 years flight experience required for SFS designation (of which 600 hours and 6 years must have been as a designated FS).

All in all, the flight surgeon has quite a bit of flying to do. Each of us knows the amount of time that may be invested in as little as 1 hour's flying. First, there is flight planning, then preflight, then taxi and clearance. Finally, there is shutdown and postflight briefing. Consider along with this the original arrangements for the flight and transportation time to and

from the airfield or heliport and the time really mounts up. Even more reason for making our flying time count.

Let's examine some do's and don'ts for flight surgeons when they fly. Since there are only a few, we'll look at the don'ts first.

• *Don't use flight time to catch up on much needed sleep.* Granted, physicians are frequently overworked by night duty and the like, but the aircraft isn't the place to sleep. If nothing else it shows little regard for one's own self-preservation. There are never enough eyes for clearing the skies—especially in crowded military airspace (admittedly the gentle vibration and drone of the engines can easily lull the unsuspecting into deep slumber).

• *Don't read or write in flight.* There is never enough time to catch up on medical journals, but substituting a realistic learning experience for someone else's testimony seems foolhardy. The same applies to completing administrative details of the day's work in flight. Leave them back at the office.

• *Don't interfere with mission essential procedures.* Air crews never appreciate light conversation when they are attempting to transmit or receive communications. Look and listen. With experience one learns when to speak and when to remain silent. Even less appreciated is the flight surgeon who, without invitation, plays with switches or controls. Not only is this annoying or distracting but also downright dangerous.

The don'ts are probably intuitively obvious to most flight surgeons. However, all of us slip from time to time and need to consciously avoid such pitfalls. The more important side of the coin is the do's. . .how to make each flight more productive of a better understanding of the man-machine-environment complex.

• *Participate in flight planning.* If time permits this can be very beneficial. It operationally orients the flight surgeon prior to flight and is a good time for reflection. . . Where are we going?. . .What is our mission?. . .What is the weather?. . .Are we equipped to face potential environmental stresses?

• *Participate in the preflight inspection of the aircraft.* This enables one to become more conversant with aircraft systems. It also helps a flight surgeon realize the unique problems to be confronted during preflight at night or during extreme weather operations. Finally and most importantly, it permits a flight surgeon to see firsthand some of the safety hazards and trauma risks that exist. . . falls while mounting and dismounting for rotor head inspections. . .blows by swinging or running rotor and tail blades. . . fueling safety. . . electrical hazards, etc.

• *Examine aircraft safety equipment and crew protective equipment utilization.* Check seat belts, shoulder harnesses, inertial reels, ejection seats, parachutes and first-aid kits. Are they functional, of sound design, etc.? Survey crew utilization of helmets, earplugs, gloves, flight uniforms, boots, survival equipment, etc. By all means, *set the example for the crew.*

• *Note crew duties, attitudes and interrelationships.* Observe the teamwork required for successful mission accomplishment. Compare crews under differing conditions. Survey crews for onset and development of skill fatigue.

• *Test operation and adequacy of environmental control and life support equipment.* Have the crew demonstrate the range of effectiveness of these items. Participate in oxygen flights on certain aircraft to monitor proper application of physiologic principles and utilization of equipment.

• *Experience the more stressful conditions of flight.* Participate in night and weather flights. Learn firsthand the requirements for dark adaptation and the sensory illusions of flight.

• *Examine the provisions and potential for egress and emergency escape.* Try to anticipate what would happen in an emergency landing. What would you be prepared to do?

• *Learn navigation, instruments, and other flight controls and procedures.* Determine mental and physical demands made upon the pilot in all phases of flight—normal and emergency. Read aircraft dash 10s and other TMs prior to flight, and apply your knowledge in flight.

• *Note air crew eating, rest and relaxation habits.* This can be especially revealing on RON flights. Survey meals and accommodations at stopovers.

• *Examine the cockpit and instrument panel for the application of sound human factors engineering principles.* Examine crew stations for comfort and integration of personal equipment. Observe visibility through cockpit windscreens. Note the effects of glare on the visibility of instruments.

• *Participate in postflight debriefings.* This is the ideal time to ask unanswered questions. It is also the time to express some of your observations and findings to the crew (particularly if it involves their personal health and safety).

Finally, one must apply the experience he gains in flight. If corrective action is required, speak to aviation commanders, submit equipment improvement reports (EIRs) and educate the air crewmen. Without doubt the flight surgeon and those he serves can reap untold benefits from his inflight experience. The above discussion is certainly not exhaustive, but demonstrates the extent to which all air crewmen may benefit from a flight surgeon's application of knowledge gained through his experiences in flight.

Maintenance

WHEN PARKING AN AIRCRAFT

Postflight And Parking: The following procedures are listed to prevent abortive flights following the last flight of the day and to protect parked aircraft:

• Avoid parking aircraft in wet or slushy areas saturated with fuel or oil.

• Tow aircraft only at proper tow fittings and push by hand at proper pressure points unless otherwise instructed by applicable maintenance manual. Use caution when towing aircraft in extremely low temperatures to prevent damage to hydraulic seals which would result in strut leakage.

• After parking aircraft, chock securely and release parking brakes.

• Service aircraft systems as required by applicable maintenance manual. Exercise care during servicing to prevent moisture from entering systems being serviced.

• Drain oil tank sump and main oil drain before condensation freezes.

• Inspect oil and fuel drains and crankcase breathers for ice or frost. Remove any existing frost or ice.

• Inspect battery for charge at least once each week. If layovers are to be over 4 hours and temperature is below -20 degrees F. (-29 degrees C.), remove battery and store in a warm place.

• Drain oil system when there is no provision available for preheating oil and a long layover period is anticipated.

• When temperature rises above freezing during a long layover, drain fuel and oil tank sumps of water before temperature drops.

• Install protective covers and shields to protect aircraft from accumulation of snow, frost or ice. NOTE: If wings are wet or a freezing rain is expected, cover aircraft with a coat of anti-icing and deicing-defrosting fluid, Military Specification MIL-A-8243, before installing fabric covers.

• Partly open canopy when parking aircraft for the night or provide some other opening to prevent accumulation of frost on windows.

• Clean dirt, ice and grit from landing gear struts and hydraulic pistons. Wipe struts with a clean cloth saturated in hydraulic fluid, Military Specification MIL-H-5606. Inspect struts for proper inflation.

• Inspect tires for proper inflation.

• Install or remove snow and ice grip tires to comply with change of seasons. Use of snow and ice grip tires on clear, hard-surfaced runways reduces the life and effectiveness of the tires. Reference: TM 55-1500-204-25/1, paragraph 1-27.

★ ★ ★

Charging A Battery? When charging a battery make sure not to connect the battery charger to the battery with reverse polarity (backwards). A backward connection will not only discharge the

Matters...

battery but will reverse charge it quickly. Such a reverse charged battery will damage electrical components when connected to the aircraft's electrical system.

★ ★ ★

Towing Your OH-6A: If the OH-6A is to be towed or transported with the blades folded, the vibration pendulums must be secured with tape or cord to prevent them from striking adjacent blades as a result of bouncing. Reference: TM 55-1520-214-20, paragraph 1-23, page 1-11.

★ ★ ★

Servicing Of 42 And 90 Degree Gearboxes On UH-1B: Do not interchange the filler caps between the 42 and 90 degree gearboxes. If these caps are interchanged, the 42 degree gearbox will be pumped dry. In order to help identify the filler caps, the 42 degree gearbox caps have black dot markings while the 90 degree gearbox caps have white dot markings. Reference: TM 55-1520-219-20, chapter 1, section II, page 1-24, paragraph 1-142.

★ ★ ★

OH-58A Tip: When installing the engine to the transmission drive shaft on the OH-58A between the freewheeling unit and the transmission, make sure that the bolthead on the freewheeling unit is facing the transmission and two washers are under the nut. If the two washers are not placed under the nut, it could cause the bolt to apply torque and shear.

★ ★ ★

Damaged Spark Ignition: You can prevent damage to the spark ignitor when removing the combustion section from the T63-A-700 engine for inspection. Follow this procedure: After removing the fuel spray nozzle, support the combustion lines and remove the spark ignitor. Then separate the outer combustion case and the combustion lines from the turbine assembly. This will prevent damage to the spark ignitor. Reference: TM 55-1520-228-35, paragraph 5-15, item 1, page 532, change 2.

★ ★ ★

U-21 Tip: Never add oil to the T-74 engine when it is cold. If the oil level is below 3 quarts, the engine should be run until it reaches operating temperature, then rechecked. Then add oil if it is below 3 quarts.

★ ★ ★

OH-6A Tip: Before removing the ignition exciter on the OH-6A aircraft, ensure that the ignition system has been off for at least 5 minutes before disconnecting any leads. Ground the leads to the engine using an insulated screwdriver. Reference: TM 55-1520-214-20, paragraph 5-46, page 5-42.

Everything you've always wanted to know about . . .

ARTILLERY ADVISORIES

Captain George S. Feigley

IN AN AIRMOBILE operation every effort must be made to clear the landing zone (LZ) of enemy troops, booby traps, land mines and anything else that may endanger a successful operation. One of the best methods is to saturate the area with artillery fire just before the aircraft land.

Unfortunately, this same artillery fire can be deadly for aircraft and crews. For maximum effectiveness artillery must be kept on the area until just before touchdown, often with only a 30-second margin. If the pilot of the aircraft lands too soon or mistakenly flies through airspace occupied by the artillery projectiles, he can easily become a casualty.

Passing through a gun target line at a dangerous altitude or landing in an area which is being, or shortly will be, saturated with artillery fire has proven to be a very real danger in the Republic of Vietnam. To help prevent this AASs have been established in the combat zones.

What is an AAS? Although most of the weak-hearted would not dare use this term in anything but the strictest of technical dialogue (AASWCC-Artillery and Air Strike Warning Control Center), it is perfectly acceptable at even the most formal of social gatherings. Actually the three-letter term is nothing more than an abbreviation for artillery advisory station.

Army artillery fire, naval gunfire and tactical air strikes are controlled and coordinated by a fire support coordination section (FSCS). An AAS is part of the FSCS and acts as a point of contact between the pilot and artillery.

The AAS usually has on file such information as the location of firing batteries, naval ships, the range of the weapons firing or the impact grid and the maximum height of the artillery rounds at the summit of the trajectory, which is usually called the maximum ordinate.

Since the AAS is a local solution to a problem that developed in Vietnam there are not necessarily any set rules and regulations regarding its operation. The most common AAS found in Vietnam is the type that serves an artillery advisory area. This facility is reached by frequency modulated (FM) radio and is normally collocated with the major field artillery organization operating in the area.

Another AAS is essentially the same type facility except that the data it collects may not be limited to artillery. It is usually found in the enroute flight following radio facility and can be reached normally on ultra high frequency (UHF) or very high frequency (VHF) radio.

The advisor station could be located in a number of other facilities such as an airfield tower or the fire direction center of a separate artillery battery supporting some isolated outpost. Regardless of the nomenclature or location, one of its main functions is to furnish aviators with information needed to keep aircraft from being zapped by some foreign object flying through the air.

With the information received the flight leader can plot the relative locations of the battery and the impact grid and thus arrive at a clearly defined gun-target line that can be safely traversed.

Of course there are times and certain circumstances that make it impossible to plot the gun-target line on a chart. In this case all the pilot has to do is call in and give his location, destination, route of flight and altitude. The AAS applies this information to the situation and either clears him as planned or provides an alternate route.

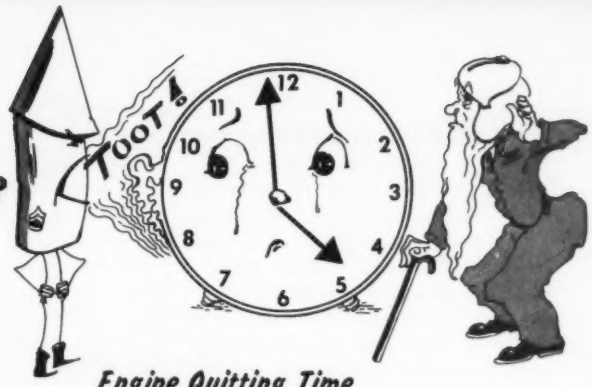
Currently artillery advisory stations are used only in Vietnam. Their functions and uses are being taught Vietnamese students by the U. S. Army Aviation School; however, there are no formal courses on this subject being taught American students.

As mentioned, Vietnam is a special case. Doctrinally, elements of the tactical operations center (TOC) provide the coordinates of firing positions to aviation units and air traffic control elements. Information on fire missions will be broadcast by fire direction centers (FDCs) of corps artillery battalions, direct support artillery battalions and division artillery. These broadcasts are monitored by the air traffic controllers. The pilot then has the option of contacting an Army flight control center (FCC) or dealing with the artillery battalion FDC for the area in which he is operating.

Procedures will probably always be adapted to the situation, however, just as in Vietnam.

Can You Remember What An Autorotation Is . . . *Really?*

Continued from page 9



Engine Quitting Time

single rotor helicopter to drift in the direction of tail rotor thrust. When Igor Sikorsky and his friends first started making erector sets into helicopters, they found it annoying to have to hold a slight amount of left cyclic to maintain a stable hover so they designed about 2 to 3 degrees of left cyclic into the swashplate. (The Bell Helicopter Company still does this today and that's why the left skid of a Bell helicopter contacts the ground first during touchdown from hover.)

When the engine quits and torque is drastically reduced you find you have a sudden need for a lot of right pedal. That reduces tail rotor thrust and the aircraft now wants to move in the direction of all that 2 to 3 degrees of compensating left swashplate. So if you don't want to go left, anticipate some cyclic correction to the right.

In an actual forced landing there are some procedures that bear mentioning:

Prior planning or anticipation. Expecting the engine to quit and planning for it may not make you the most daring and exciting pilot in your unit, but it might make you the oldest. I once heard a helicopter defined as "an assemblage of nuts and bolts vibrating and counterrotating in opposite directions, and obviously manufactured by the lowest bidder." If you think of it like that maybe you *can't* expect that engine to run all of the time.

Planning ahead might be as simple as keeping within autorotative distance of a forced landing area. If the tactical situation dictates staying out of the area between the 50 feet AGL and 1,200 feet AGL, which we all fondly remember as the dead man zone, keep your air speed high enough to do a low level autorotation. If you overfly dense jungle where there are no forced landing areas available, stimulate your mind to the point of reviewing procedures for settling into trees—like picking the most sparsely vegetated area; don't go into dead trees because they are like punji stakes to an aircraft; and zero air speed in deceleration. . . settle in vertically.

Another factor is *awareness.* Be aware of winds, density altitude, loads and even your ability. It's obvious that if you have a tailwind or crosswind you can expect an increase in your rate of descent, but if a suitable area is available for landing you might be so concerned with making the area that it doesn't occur to you why your glide is so short. Another surprise may develop if you think you can autorotate as far in the hot afternoon with a loaded aircraft as you did in the morning without a load. And spiraling a loaded gunship down to the area directly below, with low air speed, may present a rate-of-descent problem that will have to be solved with a very neat initial pitch pull.

As a rule, aviators are egotistical. They say things like, "If I had an engine failure I could make it to right there." Most of the time they do, too.

Remembering those silly *procedures* also deserves mention here. For instance, do you think you would remember to turn off fuel and electrical switches (battery and standby) and to make a radio call? (You still can if you have the main generator on and it will cut out when the transmission slows up during initial.) How about at 300 AGL. . . or 150? Maybe! Remember also if you are injured and probably dazed with only the thought of getting away from the aircraft uppermost in your mind, you should be acutely aware of the still turning rotor. If you stumble into it, your successful auto will certainly have been futile.

Night autorotations. The trouble with night autorotations is that it's difficult to determine exactly how high you are. Generally you will have a tendency to decelerate high because of glare fixation from the landing light. To combat this look about 10 degrees left or right of the light and you can use a quick glance out of the side window to determine when to pull initial.

Without twin-engined helicopters, and until a practical emergency escape system is developed, rotary wing aviators like the captain of the good ship *Titanic* will have to go down with their ships. However, the outcome can be something other than disaster if the helicopter pilot knows what he's doing.

How about you? Is your autorotation as good as you think it is . . .really?

The Fuzz Also Fly

Major Walter J. Chrobak

The use of helicopters for assistance in crime prevention, enforcement and physical security is already well documented by civilian police agencies, and the techniques and principles already learned could in many cases be adopted by the military police

MILITARY POLICE aviators? Yes, gentlemen, they do exist. The next time you buzz a beach, perform an unauthorized autorotation or otherwise violate a flight regulation should you expect to see a UH-1 Huey with a blue rotating beacon on your tail? Not at all. Though several civilian law enforcement agencies do use helicopters for Federal Aviation Administration (FAA) regulation enforcement, this is not a mission of the Military Police Corps.

Organic aircraft for command and control (C&C) purposes are currently planned at two levels by the military police: The MP brigade will be authorized one UH-1H and one OH-58, while two UH-1Hs and three OH-58s will be found in the MP group. Since the C&C mission will normally involve a military policeman in the role of an observer or passenger, the only aviation rated officer position at both group and brigade level is that of a section commander. Other pilot positions will be filled by warrant officer aviators. Change 3 to TOE 19-262G

and 19-272G authorizes these structures and only awaits publication.

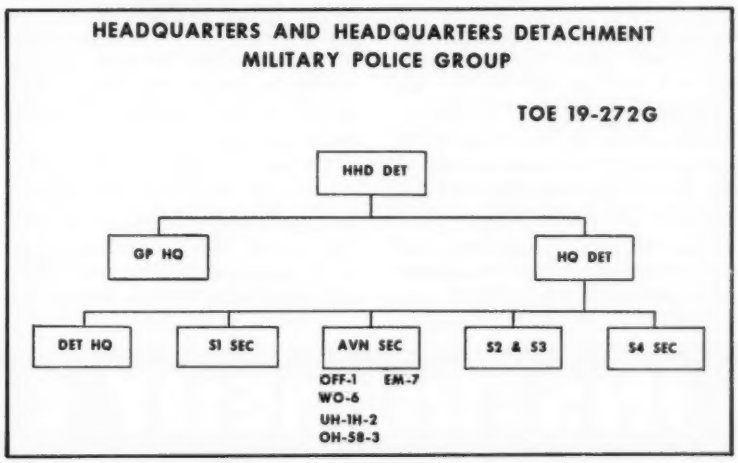
Though group and brigade aviators are all that we now find authorized within the Military Police Corps, the emphasis being placed on airmobility makes the investigation of other areas essential. If a significant improvement in any military police functional area can be realized through the inclusion of aviation, then an expansion of military police aviation assets may be justified.

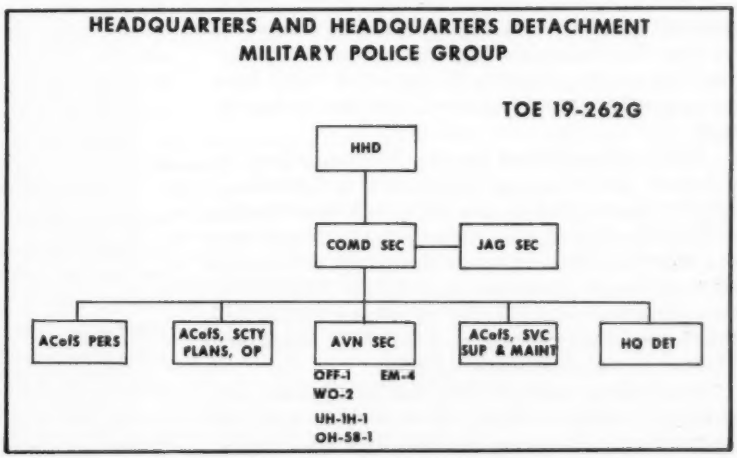
Even a cursory examination of many of the areas in which the military police have primary responsibility reveals the potential contribution that aircraft would provide. In the area of circulation control alone the helicopter would provide a means to detect and prevent the massing of vehicles, select the best and alternate routes for movement, find and redirect as necessary large numbers of refugees and reduce manpower requirements by leapfrogging traffic control points.

The transportation of enemy prisoners of war from forward collecting points could be greatly speeded by using aircraft and the possibility of more timely intelligence being gained as a result cannot be discounted. The use of helicopters for assistance in crime prevention, enforcement and physical security is already well documented by civilian police agencies, and the techniques and principles already learned could in many cases be adopted by the military police. Finally, the speed provided by air movement would greatly assist in the rapid response necessary in both civil disturbance and disaster and rear area protection operations.

Several benefits that could be gained through the use of Army aviation are, therefore, readily apparent. The question that must be answered, however, is whether organic military police aviation is necessary to achieve these benefits, or whether separate aviation units could more efficiently provide the support required by the military police. This must be decided while remembering that even the MP aviation sections at group and brigade are dependent on outside units for aviation maintenance support. In addition to maintenance, aircraft utilization, effective employment based on the commander's knowledge of military police operations, responsiveness to needs, manpower limitations and possible modification of aircraft for special missions are only a few of the other areas that must be carefully examined before any decisions are made. The potential usefulness of Army aviation in many military police areas is obvious, however, and should not be ignored.

The Military Police Corps now has 46 aviators assigned. As promotions occur this number may be expected to increase until a higher leveling off point is reached. Maintaining the concept that warrant officers will fill pilot positions unless a command responsibility exists should keep this number at a reasonable level. What we don't want or need is every man an aviator when a requirement for this rather expensive special skill or background does not exist.





VIEWS FROM READERS

Continued from page 1

and capable helicopters (CH-21s and CH-34s) had just appeared and promising experiments were beginning with aerial weapon systems. Equipment, which was not known about in World War II, was now available or at least on the drawing board. In short, airmobility was on its way. It was not a dream any longer.

I recognize with great respect the way the U. S. Army keeps its glorious tradition high and in many ways I feel we should learn a little more from you. But 15 or 16 years ago, when the German Armed Forces became a reality again and our Army aviation was born, there was no tradition to look upon as a help (or obstacle) for the integration of aviation into the Army. Therefore, I think it was almost self-evident, with the upcoming weapons systems in mind, to create a responsible, aviation branch.

After 15 years of experience, we really believe that our Aviation branch is fully integrated and that there is no other than profitable coincidence of interest with all the other (and older) branches. We feel the same as you—first, our aviators have to be Army officers. We do not have branch orientated officer candidate schools or academies. German officer candidates of all branches have to attend the same courses of instructions on one of our "Heeresoffiziersschulen" (Army Officer's School). Later on, before the doors are open for promotion to a field grade rank, all of our Army captains again undergo together the "Heeresauswahlpruefung" (qualification exam for field grade officers). Actually, there are a lot of various examinations over a year's period and these exams are Army orientated, which means there is absolutely no difference between an exam for an Infantry, Armored or an Aviation officer; they are all Army officers first, they sit in the same classroom.

As in the United States, we have our Infantry, Engineer and Aviation schools, as well as schools for all the other branches. Here the officers and NCOs receive the necessary special training to handle the complex and sophisticated weapon systems. But again the students learn also that there is no branch, which is an end in itself.

U. S. Army aviation was born at Ft. Sill, OK, and at first was only authorized for one branch—Artillery. Today, it is authorized in 10 branches.

In 1956/57 Germany decided in order to have modern and sophisticated helicopter weapon systems, it would be a good idea to incorporate them into just one branch. That did not mean less integration. It was just a way of a different basic organization which, of course, like every organization also has its disadvantages. However, some of the advantages should be mentioned. As a branch it is much easier to handle all its personnel and equipment and it might be a little bit easier to find the right solution. Think about standardization, there is only one branch involved; no coordination for aviation nomenclature between the branches is necessary. For example, I have just read an article which stated, "We in Armor define NOE as so and so." We have only one definition. "Tiefstflug" (nap of the earth below 30 feet) means the same in altitude and speed for Armor, Infantry or Signal.

Finally, do not forget the effectiveness in a tough combat situation when you have company and battalion commanders who are aviators available, who are without exception Senior and Master Army aviators, often having attended the U. S. Army Aviation School's outstanding Rotary Wing Instrument Flight Examiners Course.

Again, I do not plead for a change here. I have only tried to tell you a little about our Army Aviation branch and, last but not least, that "integration" is the key word for all branches of the German Army.

LTC Friedrich H. Feldmann
German Liaison Officer
U. S. Army Aviation School
Ft. Rucker, AL 36360

INSTRUMENT CORNER

Q. While holding, one is striving to adjust the pattern to where the inbound leg is exactly 1 minute. The outbound leg would then vary, depending on the velocity of the wind. Why then do controllers specify a time for the outbound leg?

A. The initial outbound leg of a holding pattern at or below 14,000 feet mean sea level is flown for 1 minute. Above 14,000 feet mean sea level the leg is flown for 1½ minutes. Subsequent outbound legs are adjusted (depending on the wind) so that the inbound leg is 1 minute at or below 14,000 feet mean sea level and 1½ minutes above 14,000 feet mean sea level. (Reference: TM 1-225, paragraph 13-16a, b, dated December 1968.)

The problem arises in TM 11-2557-29, FAA Terminal Air Traffic Control, controller's manual. An editorial error in paragraph 904, Detailed Holding, stated: "For detailed holding instructions, issue the same items as for general holding, but always specify outbound leg length in minutes, miles RNAV, or miles DME, and direction of holding pattern turns."

Change 6 to this manual with an effective date of 1 Jul 72 deleted the word *outbound*.

In one case only may a pilot exceed the 1 minute inbound time limit. This is the exception made for extreme outbound tailwinds. DOD FLIP, section II, page II-84, includes this note: "NOTE: Exception for Extreme Outbound Tailwinds. In extreme wind conditions, even though the turn inbound is initiated when abeam the station, the inbound leg may exceed the 1 or 1½ minutes limit. In this case only is the pilot authorized to exceed the time limit inbound."

LOW LEVEL

Continued from page 3

hour-per-day basis. No matter what the "war stories" indicate, it is not that way now.

A development program has been approved by the Chief of Research and Development to improve our night capability. This program will determine what a pilot needs to enable him to fly and navigate low level during darkness. It will include evaluation of current data, simulation and flight testing.

Numerous items of equipment are either on the shelf or are within the spectrum of today's technology, which may provide the capability the Army must possess for the war of the future. These items include systems which utilize radar, infrared, low light level TV and laser, to name a few. Through technology it is not beyond the realm possibility for a helicopter to depart on instruments, navigate nap-of-the-earth to prevent detection, acquire a target, destroy it or complete a medical evacuation mission and return safely to home base under conditions of adverse weather or in darkness.

A study conducted by Human Resources Research Organization (HumRRO) in June 1971 concluded that a required improvement in Army low level aerial navigation is constrained by a hierarchical relationship between equipment, procedures and training. Lack of adequate equipment constrains improvement in procedures, and procedures in turn constrain improvements in training. Present equipment requires elaborate procedures to compensate for its deficiencies in low level navigation, and extensive training is a necessity to convey these procedures to the pilot.

A major problem associated with acquiring new equipment to assist the aviator is to devise an interface which will permit him to effectively utilize it. Using numerous pieces of equipment requires an integrated display which presents the required information to the pilot in consonance with his brain and muscles to use it. When under instrument flight conditions at low level, and while engaging a tank, too much information may be worse than not enough. Unfortunately, very little has been done to determine what cues are required for flight and mission accomplishment. Human factors are a very important aspect of solving the puzzle of low level night/weather operations and it is imperative that our research and development efforts do not neglect this area. The multimillion dollar aircraft with a lethal load of ordnance is virtually useless if the pilot cannot fly it where it is needed.

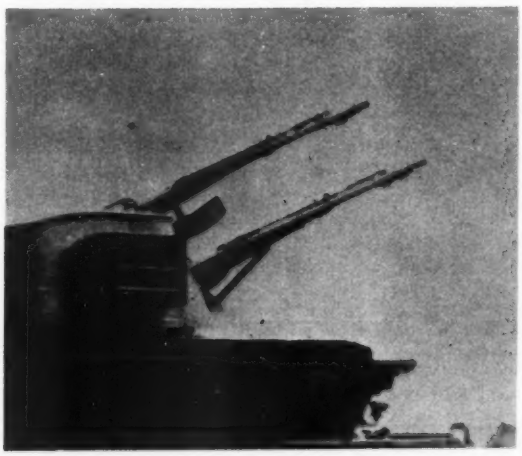
HumRRO Technical Report 71-10, authored by Dr. Robert H. Wright and Mr. Warren P. Pauley, provides excellent guidance for improvement in low level navigation training. Some of the improvements advocated are:

• Reorganize training around the line of position (LOP) navigation techniques. Almost all training materials emphasize use of combinations of pilotage, dead reckoning and radio navigation aids.

• Avoid unnecessary distinction between low level and normal altitude navigation. Where satisfactory performance can be attained at normal altitudes with low level procedures, training should emphasize these procedures for all types of flying in order to maximize transfer from routine flying experience to low level flying.

• Introduce terrain familiarization techniques as a part of low level navigation training. The only practical way to currently produce effective rapid response low level navigation is through use of crews sufficiently familiar with the terrain. This training would be oriented toward a routine operational procedure of obtaining a high level of terrain familiarization prior to the first mission in an area by means of systematic study of maps and other available cartographic aids. It would also be oriented toward establishing systematic in-flight procedures that would increase the rate of acquiring area familiarization under continuous low level flight conditions.

• Consider introducing a lens of 180 degrees or greater field of view



The ZSU 23-4 is a self-propelled Soviet antiaircraft system of four 23 mm guns mounted on a tank or tracked vehicle. A rate of fire of 200 rounds per minute per gun suggests its lethal nature

Line of Hueys inserting troops in Vietnam . . . if an aircraft is more vulnerable to enemy detection at high altitude we must plan to operate low level

motion picture, slide and picture imagery format in order to put across most information acquisition points in training. This format has the advantage of permitting presentation of the entire cockpit visual scene using only one projector and instant appreciation of the relative bearing to a feature. With conventional format the azimuth of the scene centerline, scene edges or both must be provided for each scene, and at least three projectors must be coordinated and continuously referenced in presenting low level navigation training points. With multiple conventional projectors the training points become lost in the process of keeping track of scene orientation data.

• Provide realistic classroom practice in low level information acquisition in regard to low level perspective and in the timing of information presentation. The masking of features that exists at low level should be illustrated from the standpoints of reliance necessary on features with vertical development and the right-left looks at crossover necessary for information acquisition from planar (roads, streams) features.

• Teach special low level navigation "rule-of-thumb" procedures that eliminate or minimize manual or mental calculations. Included would be across-course corrections, along-course positioning corrections and scheduling corrections.

• Give full consideration in training to the problems and techniques for managing maps in the cockpit (see "The Tactical Map And You," October 1970 DIGEST).

• Place major emphasis in classroom training on student practice in making the decisions of low level navigation, such as "Where am I?" and "What should I do?"

There is currently some activity underway to implement low level training. At Project MASSTER nap-of-the-earth training is being explored in conjunction with testing the Triple Capability Division (TRICAP). The U. S. Armor School at Ft. Knox, KY, is conducting this type of training in its scout and attack helicopter pilot training.

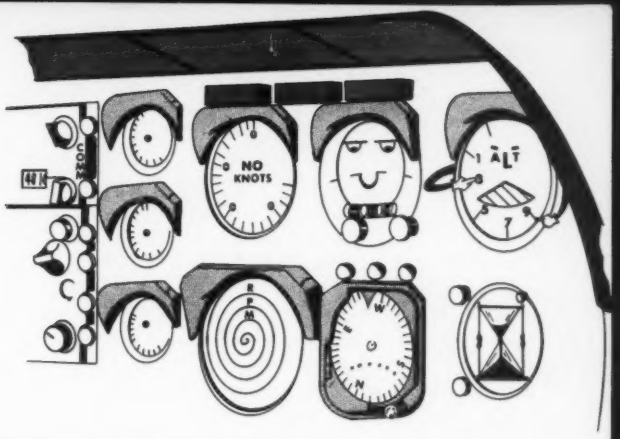
The U. S. Army Aviation School at Ft. Rucker, AL, has been evaluating a small scale experiment being conducted by its Aviation Armament Division and it is anticipated that the initial training for pilots will include this type of training.

It must be realized that there are many problems associated with low level flight. However, the question we must ultimately face is: Can we afford to ignore the recognized threat of the future? It is true that we do not currently have many items of sophisticated equipment that are required to accomplish all of the tasks we envision for Army aircraft. With a diminishing budget it is quite possible that we may not have these items for the next war. It is, therefore, a necessity to do the best we can with what we have.

A comprehensive flight training program should be established at unit level and at the Aviation School. This program must teach the principles of nap-of-the-earth flight in a well supervised and controlled atmosphere. This training should not be a one-shot affair, but a continual on-going program. With a well organized and planned program, the desired results can be attained without jeopardizing the unit's safety record. When the boss has placed you nap-of-the-earth and is watching you perform, there isn't time for complacency.

It is imperative that we do not experience a high loss rate in both aircraft and aviation personnel while training our aviators to adequately perform low level flight required for a mid/high intensity conflict. We must ensure that our aviators are well qualified in their techniques. Let's be sure that no young aviator failed to get the word because we didn't tell him.

Instrument Flight WITHOUT Instruments



Continued from page 5

with a full fuel load, pilot and passenger will approximate a 500 feet per minute (fpm) rate of climb or descent. Avoidance of radical power changes is important. The use of the clock (or a copilot's watch) will provide a quick check on the rate of altitude change. Use the following as a base: at 500 fpm 12 seconds equals 100 feet. Avoid adjusting power unless the climb or descent is obviously excessive.

The discussion so far has indicated that a constant altitude is a result of constant power and pitch attitude, based on use of the air speed indicator coupled with the altimeter. The technique is comparable to partial panel flight in the UH-1. In a level turn, however, the angle of bank presents a different problem. Again, experience will tell what angle of bank results in a standard rate turn. In an LOH a 13 degree angle of bank results in a standard rate turn at 80 knots. In attempting to use an attitude indicator, initiate the turn by moving the cyclic so that the index will shift 13 degrees from the stabilized position (one that is offset from center). Immediately cross reference the RMI and clock, time your turn checking every 30 degrees for 10 seconds. Increase or decrease the apparent angle of bank based on time. Note that if it is difficult to establish a turn, it is better to favor the shallower angle of bank than the steep.

It has been suggested that the magnetic compass can be used as an attitude indicator, depending on the degree of desperation of the pilot. Unfortunately, its usefulness is limited to substituting for a turn gyro in the discussions presented above.

The following procedures can be used to handle inadvertent IFR not only in poorly equipped aircraft but also those that are fully instrumented.

1. Consider the known terrain; the procedure used will depend on the proximity of mountains or level areas.

2. Make a positive transition to the instruments.

3. Establish straight and level flight (allow time to gain firm control of the aircraft).

At this point a decision to either attempt a return to VFR conditions or continue IFR must be made. In returning to VFR continue the following:

4. Execute a 180 degree turn.

5. Initiate a descent once straight and level.

6. Continue flight upon reaching VFR.

If it would be impossible to expect a return to VFR quickly and the decision is made to continue IFR, start again with 3 and continue:

4. Climb as fast as feasible to a safe altitude—straight over level terrain or a spiral in mountains.

5. Establish radio contact with the nearest air traffic control (ATC) facility immediately and continue.

Other areas that can affect the successful outcome of IFR flight minus instruments are the type and location of instrument approaches available—*if* they become necessary. Easiest to handle with limited instrumentation is the ground controlled approach (GCA) with its precision approach and no-gyro capability.

The latter is more important since it eliminates the necessity of working with an unstable compass or one that is hidden behind the console as in the OH-6A. This type of approach compensates for the loss of aircraft navigational systems but establishes a requirement to know the local ATC frequencies and procedures. Probably the best asset a pilot can possess is a calm, collected approach to inadvertent IFR. The most fatal mistakes occur during the minute or less that it takes to transition to the instruments from visual flight. This is the moment when practice and attention to the aircraft's capabilities pay off. Knowing your own limitations is constantly stressed, however, in an emergency they may be exceeded. In this situation knowledge and proficiency are the personal investments that pay dividends.

There is one point that stands out beyond any other made in this article. In an aircraft that is not designed or equipped for IFR flight, *avoid foul weather like the plague.* But, a conscious effort to apply the techniques discussed to the individual aircraft you are flying could be a prelude to success in an emergency.

GETTING THE JOB DONE THROUGH ATTITUDE

William D. C. Jones
Safety Management Specialist
Aviation Division, DSCO&T
Headquarters, Third U. S. Army

FOUR YEARS AGO, in 1968, the New York Jets were touted by experts as headed for the cellar. Joe Namath, who was trying to pull the team together, was not really getting the job done. Besides that, the team's performance had been somewhat mediocre during the previous season. Gloom had settled on the team, filling every visible corner of the dressing room. With that kind of attitude, how could they be expected to win? Sizing up the situation, the coach of the Jets, Weeb Ewbank, took a decisive step. Picking up the phone, he called a Dallas, TX, firm which specializes in motivational research and training. After 2 weeks of intensive training by these experts, the New York Jets went into their regular season, winning the American Football League championship and then defeating the National Football League's champion Baltimore Colts in the Super Bowl. It was a stunning climax for a team with such bleak prospects at the start of the season.

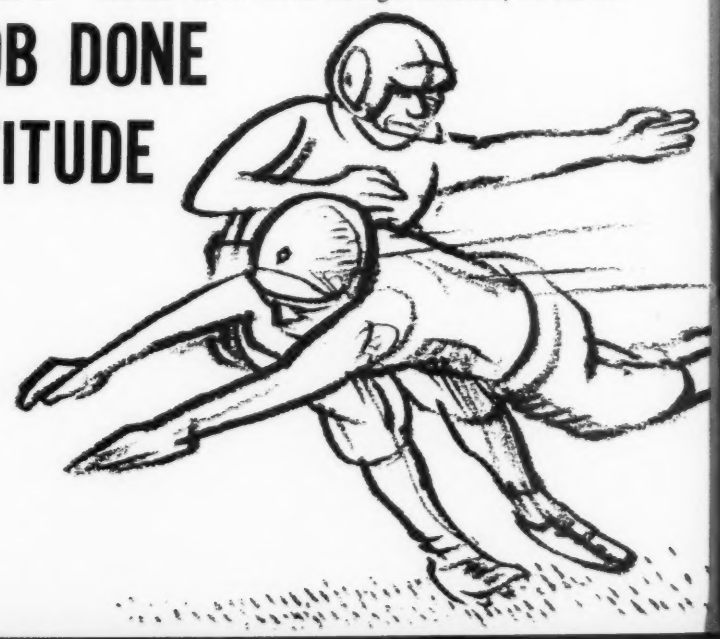
Several firms which have had their entire sales staffs trained by these same motivational experts have shown spectacular sales figures. It seems that the principal difference between people before and after training is their own personal attitudes. Does this claim have any basis in fact or is it just another fantasy in the mind of the applied psychologist? If it is factual, can anybody put the principle to use? The answers seem pretty definite.

From the many cases researched, two things seemed to emerge concerning motivated human behavior. One is that people generally do what they are expected to do. When Roger Bannister, the young man who first ran the mile in less than 4 minutes, was questioned about how he was able to do it, he replied that he guessed the main reason was that his coach expected it of him. Another reason was his own attitude of confidence. This attitude was helping him, perhaps subconsciously, to achieve or even exceed normal expectations.

It has been observed that people who lose, or who do not live up to expectations, seldom have an air of confidence. Losing is no big shock to them because they seldom expect to win. There are some exceptions to the rule, of course, but the main point is that anyone can improve his performance by improving his attitude. The big question in most minds is how.

The reasons given by researchers for improved behavior patterns as a direct result of improved attitude are somewhat technical. For those who need a reason for everything, it is put here in as simple a way as possible. Everybody has a built-in psychological mechanism, or "servo." This "servomechanism" is subconscious (acts independently of will or conscious thought), but has a degree of control over our thoughts and, therefore, our actions. If we set, by determination in our conscious thought, a long range goal, our subconscious "servo" will act daily as control on all our conscious actions, causing us to favor only those decisions and actions which would tend to direct us toward that long range goal. Whether or not this really is the case is unimportant. The important thing is that it works for most people, and it can be easily applied. Chances are good that it will work for you, too.

Only by keeping a constant positive attitude toward aircraft accident prevention can we get our internal "servomechanisms" to work for us in getting the job done. It should be the ambition of every good safety manager to improve his safety program and to reduce or eliminate accidents. The job requires high personal motivation and commitment to develop the necessary extra drive, enthusiasm and energy. If we keep the internal "servo" set in the right direction, we can de-



velop the deep, personal convictions about the job we are doing. We can do this by constantly reminding ourselves of our purpose. In this way, we develop a positive attitude through motivation and deep personal conviction.

At the same time, the "boss" should expect his unit to be accident free. He can help by creating an atmosphere where free-thinking supervisors can voice an opinion as long as the topic is in the discussion stage. People who have been made to feel as though they are only cogs in a machine will behave like cogs in a machine. A commander who sets an accident-free goal, tells the unit about it and encourages two-way communication with his subordinate supervisors is merely setting the stage. Only by dynamic, outgoing positivism can he penetrate his unit and get the message to everyone. Then he can let attitude take over on a continuing daily basis. If long term success is to be won, it must be by day-to-day progress. One step at a time is the answer to unit safety program efficiency. As in mountain scaling, we should occasionally look at the peak to remind ourselves of where we are headed, but we should also pause long enough to enjoy the scenery on the way up.

To assure good attitude on the job for all personnel in his unit, the commander can:

1. Change his own attitude by setting a long range goal of accident-free operation.

2. Change the attitude of everyone in the unit by his own day-to-day dynamic enthusiasm for accident prevention. (It really does rub off on subordinates.)

3. Work for participative management in the unit by making sure subordinates participate in creating and structuring the program.

4. Improve two-way communications (feedback) by encouraging ideas from supervisors and then hearing them out without passing judgment.

5. Realize that under the right conditions and under good command attitude, most people will not only accept responsibility but also actively seek it.

6. Establish the proper atmosphere for work at every level in the unit, orient effort with the unit objectives and see that managers make and implement decisions within their own scope of authority.

The aviation safety manager can help by:

1. Developing a deep conviction that the aviation safety management position is important, and that his own personal attitude is essential.

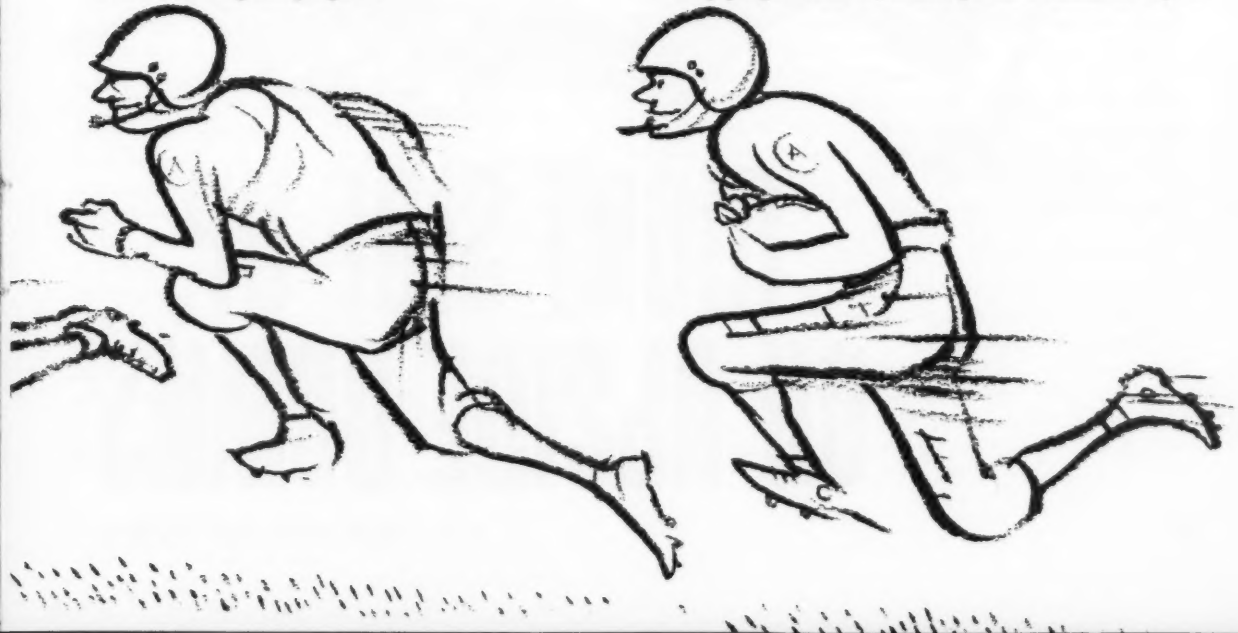
2. Complementing the CO's attitude toward safety in the unit and never slipping into complacency.

3. Being a team man. Only the effort of the group will prevent accidents in an aviation unit and not the efforts of only one man, even if that man is the CO.

4. Getting the other supervisors into the program by requesting and using their ideas in the unit safety program, and by allowing team spirit and good attitudes to pervade every level of the unit.

5. Reporting bad attitudes to supervisors for correction and change through motivational management.

In time, a positive attitude toward aviation safety will permeate the entire organizational structure as individuals adopt this attitude, then sell it to others. But remember, one day at a time is sufficient. An entire unit cannot be changed through a single day's effort. Change will come only through a *continuous* daily program and a *positive* personal attitude. Try it.



Gene Berta
Education and Prevention Dept.
USAAAVS

Accident statistics indicate that disorientation in rotary wing aircraft is particularly crucial. In a 2-year period, orientation-error accidents cost the Army $15 million, and in 30% of the accidents, someone was killed

RIGHT SIDE UP, OR UPSIDE DOWN?

MOST OF US at one time or another have had the disconcerting experience of literally not knowing which end is up. Some call it disorientation, others know it as vertigo.

Regardless of what we call it, when it hits us we instinctively try to stop whatever we are doing, reach out a hand to steady ourselves and hope it will soon pass. But the pilot who suffers an attack while flying cannot afford the luxury of stopping what he's doing. He has to keep flying, prayerfully right side up. Unfortunately, these attacks too often culminate in mishaps—some catastrophic—as a result of orientation error.

A pilot makes an orientation error whenever his perception of the motion and attitude of his aircraft differs from the true motion and attitude and he

accepts his perceptions as defining the orientation of the aircraft. On the other hand, the pilot can be disoriented but not make an orientation error if he realizes his perceptions are false and he arrives at the correct judgment of the attitude and motion of the aircraft through input from some other source such as the aircraft instruments.

Accident statistics indicate that the problem of orientation error is particularly crucial in rotary wing aircraft. Accidents of this type have been very expensive in terms of lives and aircraft. In a recent 2-year period, orientation-error accidents cost the Army $15 million, and in 30 percent of the accidents, someone was killed.

In response to this situation, the U.S. Army Agency for Aviation Safety (USAAAVS) at Ft. Rucker, AL, conducted an Army-wide survey to gather information about disorientation that would help define the problem as it relates to the Army aviator, particularly to the Army rotary wing aviator.

What actually happens when a pilot becomes disoriented? Does he have any advance warning? What is his first reaction? Does he feel he can cope with the situation? Does disorientation occur most frequently in any single phase of flight? Are student pilots more susceptible than rated pilots?

Looking for first-hand answers to these and other questions, USAAAVS sent a questionnaire to more than 12,000 rotary wing qualified pilots and students in helicopter courses. We received more than 5,500 replies. The questionnaire was designed to elicit a description of the aviator's most severe disorientation experience in rotary wing aircraft. The survey also asked questions about the physical, psychological and environmental conditions associated with disorientation episodes.

This series of articles will outline what we learned about disorientation from the 2,875 helicopter pilots who described episodes from their own experiences. In this issue, we will present findings on the frequency of disorientation, the phase of flight in which it occurred and the magnitude of the episode. Subsequent articles will include information concerning the pilot's training and qualifications, his activity prior to disorientation, his initial reaction to disorientation, factors introduced by the type of mission he was flying and the impact of other factors such as instruments, lights and loss of visual cues.

Strange as it may seem, disorientation occurs most frequently in straight-and-level flight. Both student and rated pilots reported that over 50 percent of the episodes they experienced took place while they were flying straight and level. It is interesting to note that most of these pilots were relaxed and looking straight ahead at the time they became disoriented. Table 1 shows the six phases of flight included in the survey, with the percentage of episodes reported n each.

We offered three descriptive adjectives from which to choose one that best described the magnitude of the episode: mild, moderate and severe. Results are shown in table 2. Straight-and-level flight accounted for the highest number of disorientation episodes, most of them in the mild category. It should be noted that a smaller percentage of moderate episodes took place in straight-and-level flight than in any of the other phases. In general, the percentage of severe episodes in straight-and-level flight was low when compared with that in the other phases—in some instances, substantially less. For example, rated pilots described only 13.3 percent of their straight-and-level episodes as severe while classifying 30.8 percent of takeoff episodes as severe. Rated pilot response also showed the landing phase resulting in a higher percentage of severe disorientation episodes than straight-and-level flight, while students categorized a higher percentage of climb-out, hover and landing episodes as severe.

As could be expected, unfavorable meteorological conditions prevailed to some degree in the majority of the disorientation episodes. In fact, weather conditions were poor during a large portion of mild, moderate and severe episodes described by both types of pilots. The responses indicate clearly that weather conditions are indeed an influencing, if not predominant factor in disorientation. Oddly enough, 85 percent of the aviators were flying VFR when they became disoriented. The incidence of disorientation,

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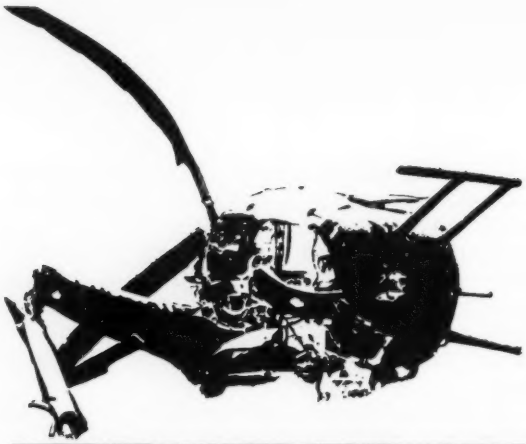
This article is the first of a series based on a soon-to-be-published technical report, "Disorientation in Rotary Wing Aircraft: An Appraisal of the Experiences of U.S. Army Rotary Wing Qualified Aviators," by Stewart Lyons, Emil Spezia, and LTC Charles Mateer, Applied Research Division, Technical Research and Applications Department, U.S. Army Agency for Aviation Safety, 1972



Confidence in his instrument flight ability

then, was over five times greater in VFR flight than in IFR. This response is alarming, considering that poor weather conditions prevailed during a majority of the disorientation episodes.

The incidence of disorientation also varied according to the time of day. Night operations accounted for 56 percent of the total number of episodes, while only 37 percent occurred during daylight hours. Dawn and dusk operations together comprised 7 percent of all ocurrences.

It is generally known that horizon clarity is an important factor in disorientation. Without a distinct horizon, the aviator loses visual reference outside the aircraft and is therefore more susceptible to disorientation. Our survey substantiated the significance of an external reference. Aviator response showed that only 22 percent of the mild, moderate and severe experiences came about with a distinct horizon while 78 percent occurred when the horizon was either completely or partially obscured. As the horizon became less distinct, the incidence level of disorientation increased.

As stated earlier, straight-and-level flight was the most frequent interval of flight in which aviators became disoriented. But disorientation also occurred quite frequently in the landing phase, especially

TABLE 1
Phase of Flight and Percentage of Episodes Reported

	Percentage of All Episodes Reported	
	Student Pilot	Rated Pilot
Straight & Level	60.9	51.2
Landing	16.4	21.0
Climb-out	10.0	12.9
Hover	9.8	12.5
Takeoff	2.1	2.2
Taxi	0.8	0.2

TABLE 2
Percentage of Disorientation Episodes Shown by Magnitude of Episode And Phase of Flight in Which They Occurred

	Phase of Flight (Percentage of Episodes)					
	Straight & Level	Landing	Climb-out	Hover	Takeoff	Taxi
Student Pilot						
Mild	57.0	40.5	44.2	30.3	37.5	33.3
Moderate	37.1	50.0	49.4	55.3	62.5	66.7
Severe	5.9	9.5	6.4	14.4	0.0	0.0
Rated Pilot						
Mild	40.1	26.5	35.2	28.2	19.2	0.0
Moderate	46.6	58.2	55.6	59.7	50.0	100.0
Severe	13.3	15.3	9.2	12.1	30.8	0.0

under unfavorable meteorological conditions. We attribute this high incidence level to hazards normally encountered near ground level such as fog and dust. USAAAVS accident records substantiate the high percentage of moderate and severe episodes reported during the landing phase. Records show "landing" as the most frequent phase of flight for major orientation-error accidents. (The effect of altitudes will be discussed in a future issue.)

Let's look now at the training and qualifications of the students and rated pilots who described their disorientation experiences in response to the survey.

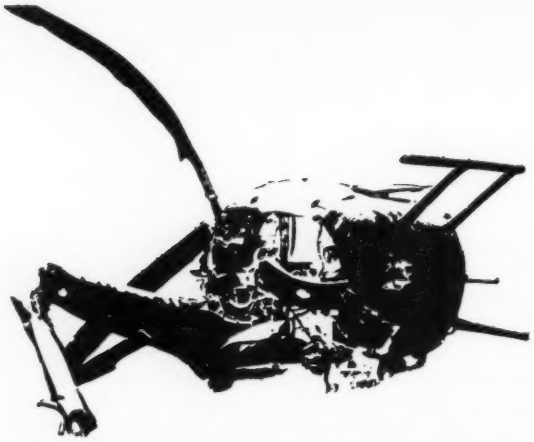
As can be seen from table 3, aviators in all age brackets are susceptible to disorientation. The mean ages for students and rated pilots were 23 and 28, respectively, and are representative of the Army aviator population of the period of the survey. The mean age did not fluctuate with the magnitude of episode, indicating that pilot age—and corresponding experience—had little or no influence in determining the degree of severity of disorientation. We matched the age of the aviator to his response to a question regarding the effect of fatigue and found that the pilot's age apparently did not affect his susceptibility to disorientation episodes in which fatigue was a factor.

It is generally recognized that an aviator's ability to fly under instrument conditions is heavily dependent on his training and experience, but the type of instrument flight qualification does not exempt an aviator from disorientation. On the contrary, aviators holding higher instrument ratings find themselves frequently flying under marginal weather conditions that are conducive to disorientation. Survey results show, however, that at least one-half of the aviators reporting disorientation held only a tactical instrument rating.

Confidence in his instrument flight ability is one of the aviator's keys to avoiding disorientation. We provided six possible answers from which each respondent was to choose one as his personal assessment of his instrument flight capability. In addition, answers chosen would provide a relative indication of the confidence of those who held tactical instrument

TABLE 3
Pilot Age at Time of Disorientation Episode

Age	Student Pilot			Rated Pilot		
	Mild %	Moderate %	Severe %	Mild %	Moderate %	Severe %
18–20	50.5	42.0	7.5	40.0	45.5	14.5
21–23	51.3	41.2	7.5	31.7	56.2	12.1
24–26	49.5	46.2	4.3	36.8	44.9	18.3
27–29	46.2	46.3	7.5	34.5	52.5	13.0
30–32	52.8	33.3	13.9	33.0	55.2	11.8
33–35	33.3	55.6	11.1	38.7	47.4	13.9
36–38	50.0	50.0	0.0	35.8	54.7	9.5
39–41	0.0	50.0	50.0	32.4	51.3	16.3
42–44	0.0	100.0	0.0	26.7	60.0	13.3
45–51	0.0	0.0	0.0	38.5	53.8	7.7
Mean Age	23.1	23.4	23.6	28.4	28.4	28.0



Disorientation occurs most frequently in

certificates. We then asked 127 rotary wing instrument flight instructors to rank the six possible answers in order of difficulty of accomplishment with the most difficult ranked number one. The ranking is shown in table 4, together with the number and percentage of aviators choosing each answer and the percentage of that number reporting disorientation experiences.

These answers not only indicated the aviator's confidence in his ability to fly a helicopter under instrument flight conditions but also provided an insight into the effect, if any, disorientation had on the aviator's confidence. A significant percentage of the respondents were not confident of their instrument flight ability. One in every five aviators (19.9 percent) selected, "I would not attempt a flight without refresher training." More than half (57.5 percent) of this group had experienced disorientation at some time. Those experiences could account for their conservative estimate of their instrument flight ability. Only one other group, much smaller in number (29), who selected "Confident that I could in daytime, but not at night," show a higher disorientation percentage (69.0 percent). Despite these findings, evidence is not sufficient to conclude that an aviator's disorientation experience affects his confidence in his instrument flight capability. Much more information is needed before such a conclusion can be reached.

Because a pilot must be proficient in instrument

TABLE 4
Aviator Assessment of IFR Flight Capability

Response	No.	% Respondents	% of Respondents Who Reported Disorientation
1. Confident I could under any reasonable conditions	1780	53.9	56.9
2. Confident I could, providing turbulence was moderate or less	362	11.0	48.6
3. Confident I could, providing no inflight emergency condition arose which required a forced landing	138	4.2	52.2
4. Confident that I could in daytime, but not at night	29	0.9	69.0
5. I would if I had to encounter only en route weather	334	10.1	53.6
6. I would not attempt a flight without refresher training	657	19.9	57.5
TOTAL: 3300			

flight to avoid orientation error under conditions of poor visibility, the distribution of responses among the choices shown in the table seems to indicate a need for additional training in IFR flight. Almost half the aviators responding (46.1 percent) selected choices 2 through 6, indicating that they had some reservations about their proficiency. The other half (53.9 percent) felt they could fly instruments under any reasonable conditions, although 56.9 percent of them indicated they had experienced disorientation. Low-level flight under low visibility conditions, often typical of Army aviation in a tactical environment, almost demands that a much higher percentage of aviators be proficient in instrument flight.

Should proficiency training be in the classroom or by practical experience (under the hood) or both?

We asked the aviators whether they had received lectures or demonstrations concerning spatial disorientation during primary training and/or advanced training. Only a small proportion of the aviators had *not* received some form of lecture or demonstration on disorientation while in training. (Included in this number were 202 who indicated no training and 485 who said they could not recall their training.) As a general rule, these lectures consist of explanations of the psychological and physiological effects associated with disorientation. The vestibular system and its common effects on the pilot during flight maneuvers, such as the "leans," are frequently discussed in the classroom. Also emphasized is the importance of aviator trust in flight instruments rather than dependence on sensory systems for flight attitude reference.

In response to a question soliciting the aviator's personal opinion of the disorientation training he had received, 77.8 percent of the aviators classified the training as adequate while 22.2 percent thought it inadequate. Many aviators described the kind of training they felt they needed. As indicated by the opinions quoted below, they see a need for training that is sufficiently realistic to give them the insight to cope with the many different conditions conducive to disorientation:

"I recommend that during rotary wing instrument training a student should be required to fly visually into a cloud to experience disorientation, and then be made to go to the instruments to overcome it."

"In my opinion, artificial disorientation could be simulated in the classroom to demonstrate and create an awareness of the subtlety in which reality becomes unreality. Such training would teach pilots the various forms of disorientation rather than have them rely on past experience and knowledge of conditions needed to combat disorientation."

"The most important factor apparent to me is understanding the problem. If the pilot understands what causes vertigo, he can combat it; that is, if he will admit he has it. Training is most important. Vertigo should be induced in training situations where it can be controlled."

In summation, major findings of this portion of the rotary wing aviators' disorientation survey are:

- One of every two disorientation episodes occurred during straight and level flight. The landing phase of flight also accounted for a large number of disorientation episodes. Because of the increased hazards at ground level such as fog, dust and terrain, one of every five episodes occurred during the landing phase of flight.
- Straight-and-level flight accounted for the highest number of all disorientation episodes reported, but the episodes were generally reported as being more severe in other phases of flight.
- The age of the aviator did not influence the magnitude of the disorientation episode. Older pilots with more flight experience were as likely to experience mild, moderate or severe disorientation as younger pilots with less experience. In addition, the pilot's age had no apparent effect on his susceptibility to disorientation episodes in which fatigue was a factor.
- At least *one-half* of the aviators surveyed initially experienced disorientation while holding only a tactical instrument rating. A larger proportion of aviators holding higher instrument ratings had experienced disorientation because of their greater exposure to more severe flying conditions.
- Almost one-half of the responding aviators considered their ability to fly a helicopter in actual instrument flight as less than proficient. One in five aviators considered his disorientation training inadequate.

AVIATION ACCIDENT PREVENTION FORUM

an interchange of ideas between readers and USAAAVS on subjects of aviation accident prevention

Technical Bulletin Compliance

Periodically, we like to call to your attention the necessity for familiarity and compliance with Technical Bulletins in the 750-991 and 750-992 series, Equipment Improvement Report and Maintenance Digest *(for fixed and rotary wing aircraft). Although a record of compliance is not required in every case, it is most important that recommended actions be implemented. In many instances, the recommendations anticipate changes to TMs, forthcoming MWOs and other maintenance information. The importance of the bulletins is highlighted in their written purpose (and we quote):*

"The EIR and maintenance digest technical bulletin is published quarterly to disseminate technical information to maintenance activities using subject aircraft and to higher commands. It is recommended that personnel examine the content of this publication to familiarize themselves with existing problems and projected improvements to the aircraft. This bulletin is directive in nature; however, it may contain informational and discretionary entries."

Rescue Team

I was reading PEARL's in the AVIATION DIGEST and it said to write if you have a question. I would really like to know how to join a rescue team. Maybe I could use the training in civilian life to get a job on a civilian rescue team. —SP4

Your personnel officer should be able to answer your questions concerning transfer into the personnel rescue field.

The Army uses medically trained enlisted personnel on board their air ambulances for rescue type operations. Their primary duty is medical aid to the patient, with rescue operations as a sideline.

Flight Records

Could you tell me what happens to an aviator's flight records when he is evacuated from RVN for medical treatment? — CPT, Aviator

The officer who clears an individual from the unit is supposed to forward his flight record along with his personnel records to the gaining organization.

Sunglasses

I have heard that some sunglasses should not be worn while flying. I would like to know if this is true, and if so, which ones and why.—CPT, Aviator

The June issue of the USAAAVS "Flight Surgeon's Newsletter" contained a column devoted to polarized (civilian) sunglasses and we quote: "The experts at USAARL tell us that polarized sunglasses are not recommended for aviators to wear while flying. There can be depth perception problems, especially over water, but the biggest problem is the potential cross polarization with windscreens. This would result in too great a reduction of light. Also, plane-polarized glasses do not protect as well as standard sunglasses against unpolarized light. Enough said."

Nomex

Being a regular fan of Forum, I'm happy to see the concern expressed by fellow aviators over the wearing of and caring for the Nomex flight suit. Most comments seem to be about non-Nomex patches and thread and the burns possibly inflicted due to these. Well, this is all fine and good, but I've seen only a few comments about a problem faced by many Army aviators who fly VIPs—that of NOT BEING ALLOWED TO WEAR THE NOMEX UNIFORM.

I have just returned from an overseas VIP flight detachment which, one month prior to my departure, decided to "go PRO" and wear greens or TWs on all code flights. When I discussed this new policy and the safety of it with the unit CO, I was briefed on the probability of a crash in a U-21 and was told that we would wear the uniforms as prescribed by the unit commanders.

Yes, the probability of a crash in a U-21 or any other multiengine aircraft is very remote when

you compare incidents to hours flown. In the last 2 years of flying one U-21, this unit only had one gear-up landing, one single-engine approach and landing with a Code 5 on board under IFR conditions after a fuel control failed, one battery fire in flight and one nose section fire when a heater malfunctioned while waiting for a Code 5. Why can't all aviators use the protective equipment designed for us?

A commander who prohibits his pilots from wearing Nomex not only is *not* looking out for the welfare of his men, but also is hindering his pilots in protecting their passengers. A Nomex flight suit could well mean those few extra seconds needed to put a burning airplane on the ground safely. Or look back to the May 1971 AVIATION DIGEST at Laurel D. Sand's article "TOOSOONOLDT AND TOOLATESCHMART" and read about the pilot who, after his U-21 crashlanded and caught fire, had to fight his way back through panicky passengers to open the door for their escape. What if he had been incapacitated by the fire? The fact that he looked "pretty" during the previous part of the flight could have meant the lives of his passengers.

The government spent quite a bit of our tax money to keep us from getting burned while serving our country by designing the Nomex flight suit. They even made it so it had just the right amount of pockets in just the right places so we could carry all the equipment we need to do our job. And it even comes in that favorite Army color so we don't look too out of place when we go to the club with our infantry friends. Uncle Sam didn't spend all that money for us to say, "It's ugly, so we'll wear our greens." So why can't we wear them?

It seems that the commanders who don't like the Nomex are mostly those who were rated back when the flight clothing issue was over what color flying scarfs all the aviators would wear so as not to make the ground troops too jealous. These guys just don't realize the true purpose of the Nomex flight suit. You mean a guy can crash and burn and come out with just a little sun burn? Amazing! Command information classes on the purpose and qualities of the Nomex flight suit to be given to all military personnel would help update aviation personnel as well as promote understanding among ground troops who wonder about our "funny looking fatigues with all the pockets." I'm sure that if ground commanders would read BG Spruance's address on wearing of flight gear (he survived the fiery crash of a T-33), there would be a trend away from getting the pilots into greens, TWs or fatigues toward getting protective clothing for everyone who flies in Army aircraft.

In addition to education on the Nomex, AR 95-1, paragraphs 4-12 and 4-15, should be changed to read that all crew members will wear leather boots, fire-retardant clothing, flying gloves and helmets on *all* flights in *all* Army aircraft. And local commanders *will not* change the flight uniform.

The U.S. Army Aviation School does an excellent job of impressing safety on new aviators, but these aviators after graduation go out to units only to be frustrated by commanders who consider safety as something nice they talk about for school topics. In school we couldn't wear metal insignia on our flight suits—notice all the metal insignia on greens and TWs?

I've wondered sometimes while I was flying just how much of my greens that VIP behind that closed cockpit door could see? By the way, do you think we ought to require our flight surgeons to wear greens when they work on our burned bods so they'll look pretty, too?—CW2, Aviator

We are happy to hear that you are a fan of the Forum. Your points in this letter are well taken and need no additional verbiage from us. We suggest that you submit a DA Form 2028, complete with justification, requesting that these particular paragraphs of AR 95-1 be changed. If safety-conscious people like yourself keep hammering away at the system, eventually we can get the needed changes.

Cold-Climate Survival Kit Candles

I noticed one of the main differences between hot- and cold-climate kits was the five candles, illuminating, type I, FSN 6260-840-5578. At first, I thought this was odd. Later I talked with a soldier who was stationed with an arctic ranger company. He stated that by digging a hole down into the snow in the shape of a light bulb, and then glazing the inside with a candle, a temperature of 68 degrees could be attained. This was done with one candle burning and the body heat of two people inside the hole. I was wondering if there is any truth to this? Also, if there is any other purpose for the candles?—SP4, Canal Zone

We are glad you asked these questions. Pearl has the answers on page 40.

Readers are invited to participate in this forum. Send your ideas, comments and recommendations to Commanding Officer, USAAAVS, ATTN: E&P Department, Ft. Rucker, AL 36360

COLD-CLIMATE SURVIVAL KIT CANDLES

TM 55-8465-209-10 (always a good place to start looking for information) states that candles not only provide light but also create warmth in a shelter. Although the exact temperature created in such a shelter cannot be verified because of the many variables involved, it is true that one burning candle and the body heat of two people will generate sufficient heat inside the snow shelter to provide living conditions adequate for survival. A 4-inch candle weighs less than 1 ounce and may burn 3¼ hours if protected from the wind.

There are many other uses for a candle in a man's fight to survive. For instance,

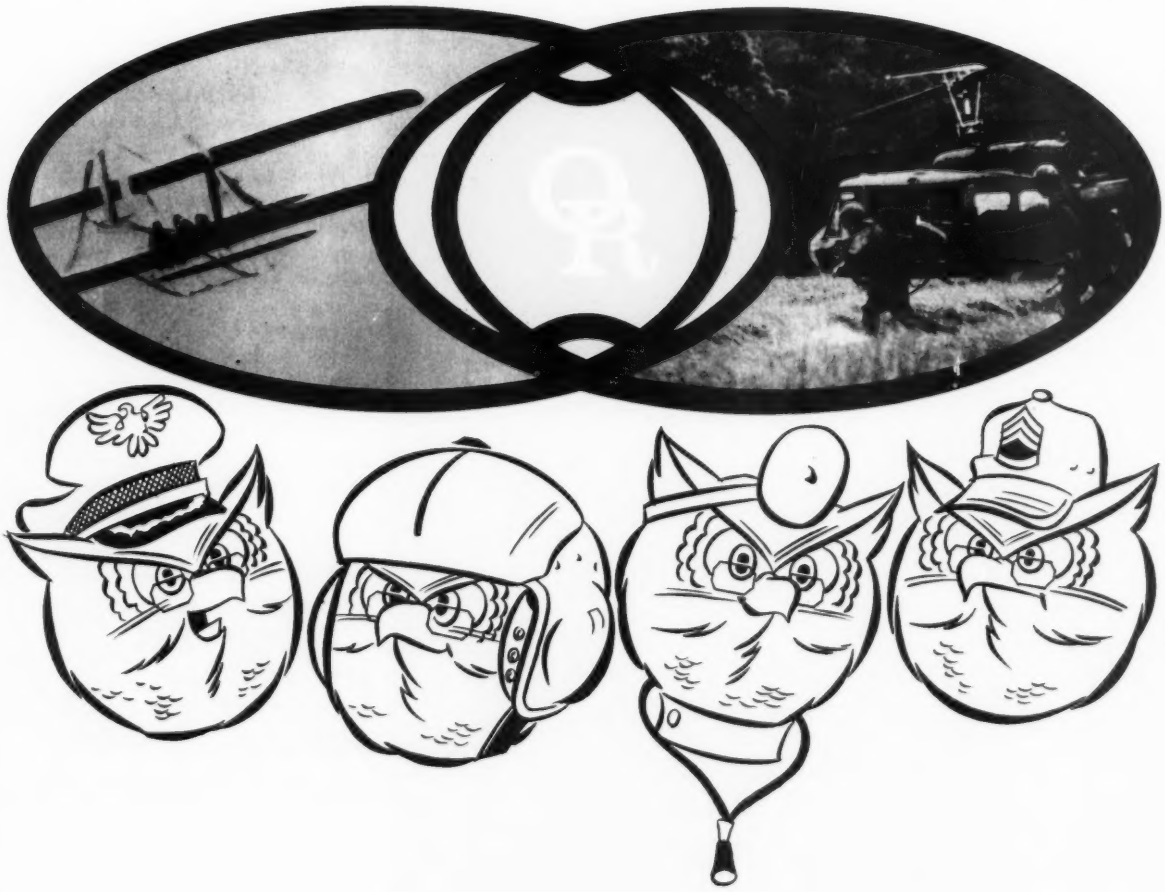
- A candle can be lit in any temperature, used to lubricate zippers and used as emergency food.
- Practically indestructible (it resists dropping, soaking in water, etc.), it will provide light for reading maps and compasses.
- A candle burning inside a tin can makes a heater for a small, snug shelter as well as a fairly good lantern that will operate in light wind and rain.
- It will ignite damp fuel that matches alone would never ignite.
- It can be used to prepare food or hot beverages.
- The candle is good for blister prevention. It should be rubbed on the heels and toes of socks when shoes begin to chafe.
- The candle can be used to lubricate the hand-held socket used in the bow and drill method of fire making, and the seams of leather boots can be sealed with the melted wax.

PEARL'S

Personal Equipment & Rescue/Survival Lowdown

If you have a question about personal equipment or rescue/survival gear, write Pearl, USAAAVS, Ft. Rucker, AL 36360

ORVAL RIGHT DISCOVERS A NEW WORLD



Introducing Orval Right, Chief Advisor on Matters of Aviation who expects you to GIVE A HOOT

Whooo? Orval Right, that's whooo. And you'll be seeing a lot of me in the future.

I have recently been called upon to share my extensive aviation knowledge and experience for the benefit of the Worldwide Army Aviation Accident Prevention Program which is headed by a safety-conscious group known as the U. S. Army Agency for Aviation Safety, or USAAAVS for short.

Why me? Because Army aviation has a dire need for my undeniable talents and aviation safety know-how. After all, my family has been in the flying business much longer than man's, and as for wisdom, my ancestors have been sought for advice ever since Minerva, goddess of wisdom, chose the first of my house as her favorite and companion.

As to qualifications, whooo could be more qualified? I am an expert aviator, navigator and meteorologist. In maintenance matters, I am unsurpassed. I am a superb flight instructor. No one can excell me in night flying, or in low-level and confined area operations. I know more about aircraft engineering and design than all the college professors in the world, and I have a perfect safety record. Further, my ancestors were present and recorded every attempt made by man to fly. Oh! yes, the urge to "put it in writing" is nothing new. Our family library is filled with owl journals recording man's flight progress—his accomplishments and his failures. One man, in particular, stands out in my mind—Leonardo da Vinci, the giant of the Renaissance. He not only designed flying machines but also was most concerned about man's safety. Accompanying a detailed drawing of one of his "winged machines" was the following warning:

"This machine should be tried over a lake, and you should carry a long wineskin as a girdle; so that in case you fall, you will not be drowned." Unfortunately, in his zeal, man sometimes permits his technological advances to surpass his safety efforts. I hope to help man remedy this inconsistency.

My official title is Chief Advisor on Matters of Aviation to the USAAAVS Worldwide Accident Prevention Program, but since the acronym CAMAUWAPP is a bit unwieldy, I prefer that you call me Orval, or more simply, "OR."

I have adopted the USAAAVS *Weekly Summary* for my mouthpiece, not that you won't be seeing me elsewhere. Now known as **FLIGHTFAX,** it will present those facts about the week's flight activities I think will further the cause of flight safety. It will also afford me an occasional forum for airing my astute opinions on such matters as maintenance, command emphasis, aviator technique and aviation medicine, among others, which in all modesty I must concede I am eminently expert.

But enough about me. On with the accident prevention program! And the first thing to remember is: **GIVE A HOOT!**

TO LIVE AND LEARN

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THE JOB OF an accident investigation board is difficult at best. But when all tangible evidence is destroyed, the investigator's job becomes seemingly impossible. Yet, in such extreme instances, professionals have been able to ferret out facts which, although not permitting positive establishment of cause factors, do provide much valuable safety information.

This was such an accident.

The aircraft commander (AC) of a UH-1 with five persons aboard called another UH-1, requesting the frequency of a nondirectional beacon, as he did not have instrument approach plates or navigational maps in the aircraft. He then called a coastal GCI radar site and stated he was on top of clouds at 10,000 feet. He asked for a GCA to a nearby airfield but was told this was beyond the capability of the station. His last radio transmission reported the aircraft in a right descending turn at 8,500 feet and entering the clouds. The ground station lost radar contact 12 seconds later when the aircraft was about 4 miles from land. All attempts to reestablish radio and radar contact were unsuccessful.

An intensive search failed to locate the lost aircraft and its occupants. The aircraft accident investigation board was obliged to conduct its investigation and prepare its report without being able to examine the wreckage or interview eyewitnesses.

Aircraft accident investigators can be positive in their findings a certain proportion of the time, but in many cases, because of factors that are unknown or cannot be proved, they are only able to state what probably happened. Then, known facts and valid assumptions are taken into account.

Records provided a certain amount of factual information relevant to this accident. Flight records, for example, showed that neither pilot aboard the UH-1 had experience in actual instrument flying. Weather reports indicated turbulence at considerable altitude in the area and a possibility of rime icing in the clouds. The helicopter disappeared from the radar scope soon after entering the clouds—during that crucial period when the AC was transitioning from controlling his aircraft by outside references to maintaining control by reference to the aircraft instruments. Also, personnel who were in the vicinity of the aircraft before takeoff reported the AC was operating the aircraft from the copilot's station.

After considering all the information available, including the fact that the AC had reported no *malfunction* of the aircraft or its systems, the board concluded the helicopter disintegrated in flight, probably as a result of being flown into an attitude that imposed forces on the aircraft which the structure could not withstand. Factors that could have contributed to control difficulties were turbulence, pilot disorientation, AC on the controls in left seat rather than in the right, and the possibility that icing may have caused an air speed indicator to fail if the crew did not use pitot heat in the clouds.

Although we must acknowledge that, on some

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Commanding Officer, USAAAVS

occasions, boards with more to go on have come up with inaccurate analyses, we think this board's findings make sense. Some time later, a fisherman's dragnet brought up the main rotor system, with the rotor mast snapped in two just below the rotor head —a condition lending support to the conclusion reached by the board.

The value of accident investigation reports lies in the use of the information they provide to prevent other accidents from happening. What can we learn from this accident? What can we offer the pilot, aircraft commander and aviation unit commander upon whose judgment, skill and supervisory efforts future missions will depend?

Above all else, this accident points up the importance of pilot proficiency. We use the term in its broadest sense—to include not only the skill in handling an aircraft, but also a complete familiarity with the machine and its component systems, a knowledge of weather and navigation techniques, and, for those who will fly instruments, a mastery of instrument procedures and instrument flying techniques.

It also points up the importance of forethought and planning on the part of the aircraft commander to minimize in-flight difficulties. Any condition which tends to make a flight difficult should be avoided. In this accident, the AC in control of the aircraft created a difficulty by flying from the copilot's position in the aircraft.

Flight-following procedures and requirements should be strictly adhered to. Because of confusion in communications, this UH-1 was initially reported down and safe. As a result, the search for the wreckage did not get underway until the next day.

Every aviation unit commander and supervisor should examine his conscience and assure himself he is doing all he can to improve the level of training and proficiency of the aviators for whom he is responsible, and that he is supervising actively to conduct a well-run operation. Conversely, every Army aviator should be doing all he can at all times to increase his proficiency and professional qualifications.

And, last in emphasis but paramount in importance, every aviator, whatever his level of experience and training, must know his own limitations and those of his aircraft. One of the first lessons he must learn is that there is always a line beyond which he must not go if he is to continue to live and learn. It may be true that for an aviator to operate always within a broad margin of safety is to restrict his opportunities to expand his personal limitations and improve himself. Nevertheless, every pilot must learn to recognize and avoid situations his experience has not equipped him to handle. Normally, the knowledge and capabilities of an aviator enlarge and improve throughout his flying career.

The aviator must learn to think and fly like a professional, remembering always that the mark of the professional in every field is recognition both of his limitations and those of the equipment he operates. And he must possess the self-discipline to operate within these bounds.

FULL-TIME, PART-TIME AVIATOR

MOST OF US can remember when the Reserve Army aviator performed his duties in a casual, unconcerned manner. Hopefully, when he reported for flight, he would be dressed in the uniform of the day. His preflight consisted primarily of a brisk walk around his aircraft. Having accomplished this, he would climb aboard and secure himself by means of the seatbelt, and sometimes, the shoulder harness. He would adjust his baseball cap, slip on his ill-fitting head set, if in working order, and then yell, "Clear!" before starting the engine without waiting for a response.

Those days are gone. Today, the Reserve Army aviator completes and files a thorough flight plan. He wears Nomex flight clothing, gloves, boots and a flight helmet that fits precisely for comfort and protection. After reviewing the maintenance history of his aircraft, he performs a detailed preflight inspection with the aid of a printed checklist. When he finally climbs into his aircraft and properly restrains himself, he knows he is about to fly a machine that is far more complex than those he flew just a few years ago. He also knows that there is no room for lackadaisical pilot performance.

The Reserve Army aviator of the past was a part-time pilot who occasionally flew. Today, he is a full-time pilot who flies occasionally. Yet, his personal responsibilities remain unchanged. He holds down a civilian job which is usually not related to aviation and which occupies most of his time during the work week. And he has family and civic responsibilities which include little league baseball, church, lodge and other various commitments. Despite this full schedule, he must muster both time and energy to do the

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This article was prepared by the author while attending the USAAAVS Aviation Accident Prevention Course

same homework required of a full-time airline pilot—flight planning, studying to keep abreast of changes in procedures, equipment and other technological developments, and most important, he must maintain flight proficiency.

In 1971, one Reserve Army aviation command had four aviation units that were authorized six aircraft and 26 aviators. They were assigned 26 aviators, but only three aircraft. To maintain pilot proficiency, the units had to rely on civilian rental aircraft. At present, this same command has eight aviation units which are authorized a total of 20 aircraft and 41 aviators. They have 31 aviators and only nine aircraft. By March 1973, they anticipate having their presently authorized 41 aviators, but only 15 aircraft. These aviators must still fly a minimum of 80 hours a year, 15 of which must be at night, and 20 under hood or instrument conditions. How can we cope with this problem?

FIRST THINGS FIRST

The shortage of aircraft and the overabundance of missions and aviators necessitates the establishment of priorities. Since much of the available flight time must be used in pilot and IP training missions, proficiency and standardization, the first priority obviously should go to unit training needed to accomplish assigned missions.

The next priority should be aviator training needed for pilots to attain the highest level of proficiency possible. Aviators must constantly practice routine and emergency procedures under field conditions.

Providing assistance to nonaviator units in their training programs should rate a lower priority, while furnishing cross-country taxi service should be delegated the lowest priority of all.

Hopefully, some relief will be realized as a result of the decreased demand for aircraft and personnel in Vietnam. However, an increased availability of equipment will pose additional problems, and renewed emphasis in the all-important area of safety becomes an absolute necessity.

TAKE ACTION

What can we do? We can, and should, follow all known safety practices. More especially, we should:

- Ensure that every aviator receives a thorough briefing before each flight.
- Hold regularly scheduled safety meetings and make certain that briefings are well prepared and thorough. Aviator attendance should be mandatory, and for maximum benefits, all aviation personnel from mechanics through the unit commander should participate.
- Review all SOPs and, if necessary, make revisions.
- Make certain that weather information disseminated is current and accurate.
- Provide ample maintenance training and supervision to ensure faultless maintenance of aircraft and supporting equipment.

Yes, today's part-time aviator is better dressed. His aircraft is more complex, and his training is of higher quality. He also has a wider range of duties, missions and capabilities than his predecessor. Although many things have changed, one remains the same—the requirement for a full-time safety attitude by all aviation personnel. Aviation safety cannot survive on a part-time basis.

USAASO Sez

The U. S. Army Aeronautical Services Office discusses

Merlin's Magic Or Who Believes The Weatherman? You don't believe everything you see, do you? Having complete faith in weather forecasts would be just as bad. Effective use of observations and forecasts will be made only by those pilots who understand the limitations of weather data. The wise pilot continually views aviation weather forecasts with an open mind. He knows that weather, like the wand of Merlin the Magician, can wield deceptive changes and that the older the forecast, the greater the chance that some part of it will be wrong. Since weather is a primary variable affecting flight, it must be constantly analyzed during flight progress and the aviator must realize that:

- **Forecast of single reportable values of ceiling and visibility instead of a range of values implies an accuracy that the present forecasting system does not possess beyond the first 2 or 3 hours of the forecast period.**
- **Forecast of poor flying conditions during the first few hours of the forecast period are most reliable when there is a distinct weather system such as a front, a trough or precipitation which can be tracked and forecasted.**
- **The weather associated with fast-moving cold fronts and squall lines is the most difficult to forecast accurately.**
- **Errors in forecasting the time of occurrence of bad weather are more common than errors in forecasting whether or not it will occur.**

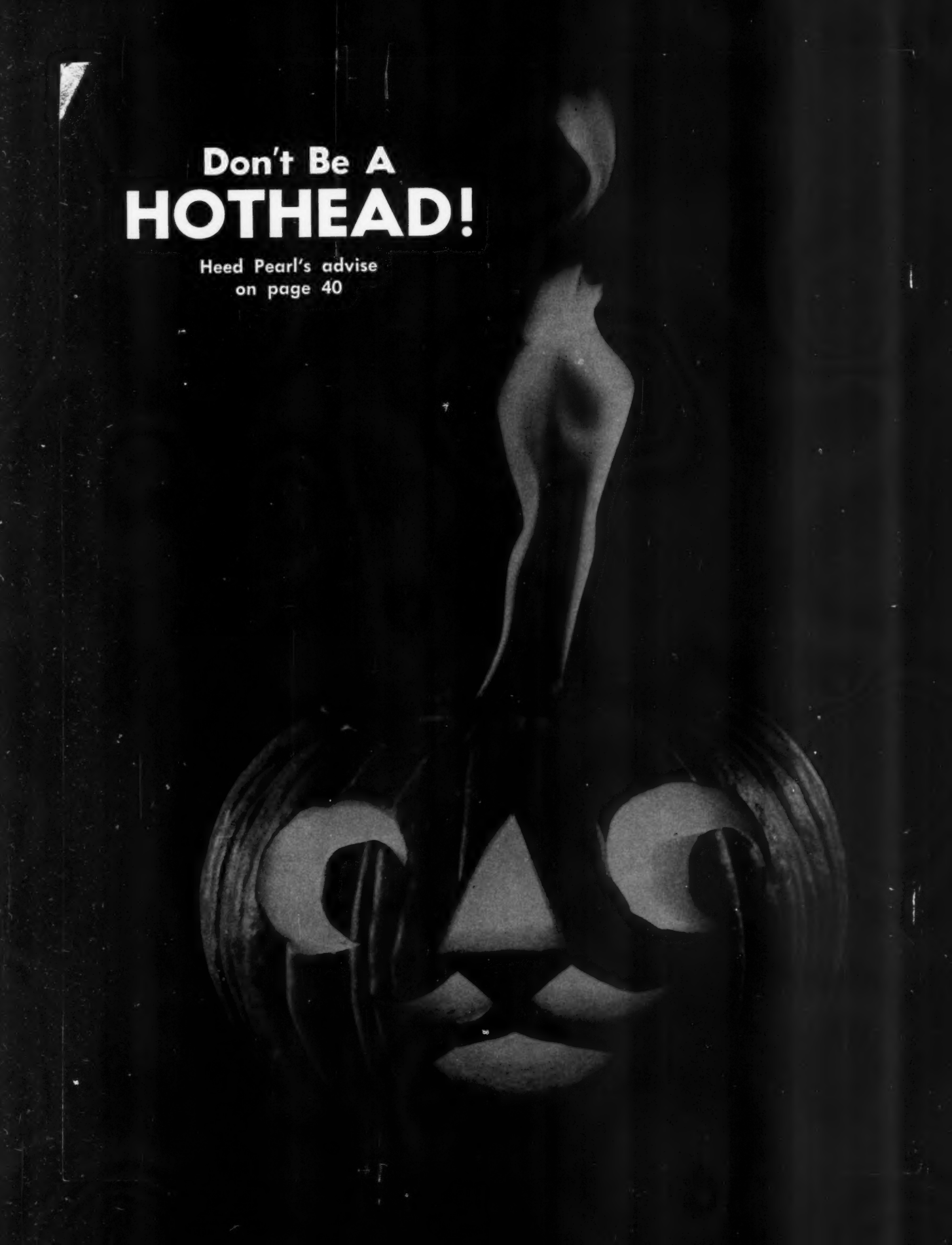
Aviators should remember that forecasters CANNOT predict the following with an accuracy which will satisfy all aviation operational requirements:

- **The exact time freezing rain will begin. His prediction would be only an approximate time; he cannot make guarantees.**
- **The exact location where severe turbulence will occur. With the winds aloft changing as rapidly as they do, even Merlin would have problems forecasting this information.**
- **The exact location heavy icing will be experienced. The forecaster can only make an estimate.**
- **Ceilings of 100 feet and below before they exist. The forecaster would be relying on his crystal ball or ouija board to relay this type of information.**
- **Even the advent of fog is an educated guess which could dissipate like magic if the temperature, dew point or winds change.**

Placing your complete faith in a weather forecaster could be hazardous. It would be like asking the magician to wave his magic wand and give you any weather you desired. A pilot must understand that there are limitations to weather forecasts and that they should be considered with an open mind at all times. In weather forecasting nothing is "cut and dried." The weatherman does not have a magic formula to predict the exact weather; many of his perdictions are educated guessimates, at best. So beware of optical illusions. Do not let a bit of legerdemain fool you. Do get the latest forecast available before climbing into the wild blue yonder. USAASO Sez—"OLD" aviator does not use "OLD" forecast.

TESTING THE TOW

CAUGHT by a quick shutter as it clears its launcher, a TOW missile speeds downrange during a test firing at Redstone Arsenal, AL. The Tube launched, Optically tracked, Wire guided missile can be fired from either a ground mount or from a variety of Army helicopters and vehicles. The missile is automatically guided in flight by commands transmitted by a two-wire communication link between the launcher and missile. The missile has had a record of outstanding success in the Republic of Vietnam against enemy armor. Two of the six members of the First Combat Aerial Assault Team accounted for 21 North Vietnamese tanks, firing the TOW from UH-1B helicopters. Watch for the full story in a future issue of the DIGEST


Don't Be A
HOTHEAD!
Heed Pearl's advise
on page 40